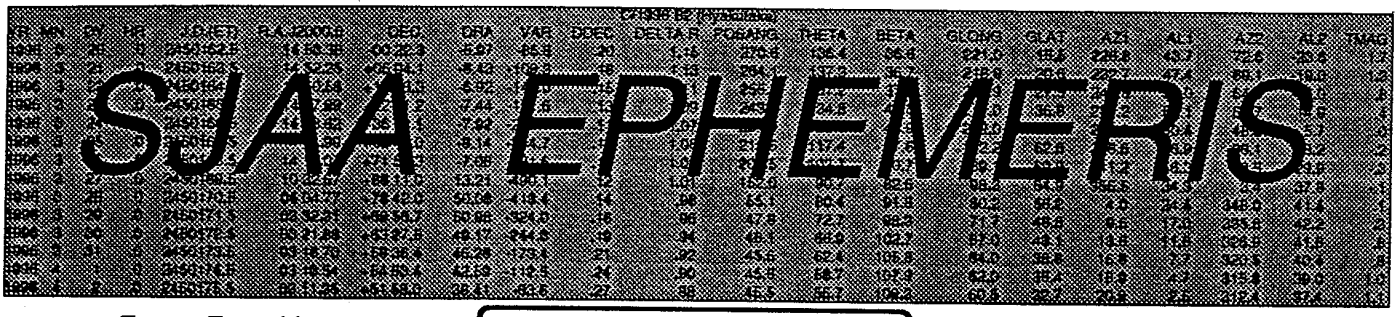

Eye on Everything
by Lew Kurtz

The July general meeting's speaker is Bob Garfinkle on Lunar Nomenclature. Remember that the July general meeting will be on June 29.

Space is still available for our **Yosemite**/Glacier Point star party on July 26 and 27th. You get free admission to Yosemite and if park admission is restricted, you will be admitted because this is part of a scheduled event. We'll have the private camp behind the Ranger's house at the Point. Call Jim Van Nuland, (408) 371-1307 10 am to 10 pm. You will need to get the gate pass and list of rules from Jim.

The Amateur Astronomers of Northern California's annual **star-b-q** is August 10 at Fremont Peak state park. SJAA is a member of AANC. AANC provides the burgers and dogs, you provide a side dish and your own drinks.

SJAA's **Observatory Committee** needs members. The observatory fund has $6,500 to spend on site aquisition/building construction. If you are interested, please contact any board member (phone numbers are on page 9).

I want to say thanks to Bob Madden, Paul Barton, and Ed Voss for taking care of the publishing of this newsletter. They put a lot of effort into this newsletter too, and should be recognized.

I gladly publish all member articles sent to me. Just call me at 739-7106 to arrange getting your article to me. If you post something to one of the sci.astro newsgroups and think it would be of interest to the club's membership, please cc me (lewkurtz@aol.com).

Remember Sky & Tel is now $27.

Activities Calendar

June

29 General meeting for July, vote on new by-laws, Bob Garfinkle on Lunar Nomenclature. Board meeting, 6:30 pm is open to all members.

July

6 No Activity.

13 Star parties at Henry Coe and Fremont Peak state parks. Halls Valley Astronomical Group at Grant Ranch. Sun set 8:27 pm, 2% Moon rise 5:19 am.

19 Houge park star party. Sun set 8:25 pm, 17% Moon set 10:35 pm.

20 Observational Astronomy Class, Houge Park, 8 pm.

26-27 SJAA Yosemite star party, Sun set 8:12 pm; 85 and 92% Moon set 3:02 and 4:04 am.

August

3 General meeting, speaker TBA. Board meeting, 6:30 pm is open to all members.

10 Star-B-Q at Fremont Peak state park. Sset 8:02 pm, 9% moon rises 4:07 am.

14-17 SJAA Mt. Lassen star party

17 Star party at Henry Coe state park. Sun set 7:55 pm, 13% Moon set 9:40 pm.

23 Houge park star party. Sun set 7:49 pm, 72% Moon set 1:59 am.

24 Observational Astronomy Class, Houge Park, 8 pm.

24 hour News and Information:

SJAA Hotline: **408-559-1221**
Home page url **http://www.rahul.net/resource/sjaa**

Texas Star Party
by George Malyj

I attended the Texas Star Party from May 11th-18th and must report that it was awesome! A full week of 21-hour days, sleeping only from about 5:30-8:00 every morning. 100 degrees hot, dry, very dusty and windy during the day; calm and mild with incredible views of galaxies, nebulae and star clusters at night. The Milky Way rising around midnight in the east looked like approaching cumulus clouds; only when you looked at them in binocs did you realize that was all stars!

I left home on Friday the 10th for the 1440-mile trek to Prude Ranch just south of McDonald Observatory in the Davis Mountains of West Texas, arriving late Saturday afternoon. Although I got there the day before the official start of the TSP, the main field was already covered with scores of tents and over 100 telescopes. At full swing, over 700 attendees and nearly as many scopes covered the observing fields. Very impressive to see this much equipment at one place at the same time! I brought my 10" LX200 SCT as well as Celestron Pro 10x50 binocs and was astounded that first night (which may have been the one with the best transparency that week) by the amount of detail I could see in galaxies such as M104 (Sombrero - looked just like a sci-fi UFO), M82 (all mottled), M51(distinct arms and bridge to the companion), NGC 4565 (edge-on that was thin and incredibly long compared to views I've had before), and the spectacular threesome of M65, 66 and NGC 3628 together in the same low-power field. Using chosen stars in the region near Corona Borealis, a

continued on page 3, see **TSP**

RTMC: Reflections From a SnowFlake

by Douglas Snyder

I see you haven't received your fill of RTMC reports yet! Thank you for taking the time to read this one. It will be short(?), complementary, and general in nature as I was so engrossed with EVERYTHING that was occurring and EVERYTHING that was present and EVERYONE that was there that it would be an injustice to focus on a particular theme. I hope I don't digress!

This was my first RTMC, but absolutely not my last. And it was a special event that I shall look back on frequently and recall the memories of smiling faces looking upwards to the heavens, not to view celestial objects, but with mouths open, catching drifting snowflakes and singing "Frosty, the Snowman." I shall recall the excitement of the children who, on Saturday night after the skies cleared over Camp Oakes, were able to view some of the breathtaking objects of the wonderous Spring skies. If the children were excited, the adults that had gathered, including myself and a very special acquaintance, were estatic. I thank all the amateurs that persisted through the questionable weather and remained steadfast by their remarkable works of science and art to allow so many of us attendees to view what so few humans have viewed. Next year, I plan to be among them.

I want to thank all the organizers, staff, and volunteers of RTMC. Their year long efforts to ensure a successful event was evident from the moment you arrived at the gate on Friday morning, and continued right through until the last vehicle departed the camp on Monday. In-between, I must mention briefly, but with no less admiration, the meal organization, service and quality - it was plain and simple fantastic for the number of people that had to be served and there wasn't a meal there that I did not throughly enjoy. It was a monumental undertaking, and I SALUTE EVERYONE that was associated with RTMC for making it not just a conference, but a CONFERENCE with all the bells and whistles. GOOD JOB, PEOPLE!

I want to thank all the vendors; to heck with the word vendors - let's say fabulous people who have a love of astronomy and the drive, enthusiasm, and creativeness to attempt to try to make available to the rest of us the products and services that we ourselves would love to have or do. I hope they all had a successful event, and I hope to see all of them, and more, next year.

I want to thank ALL the speakers, all of whom presented such great and interesting material, on all sorts of subject matters related to astronomy. They spoke to full house crowds that soaked up every word spoken and every image presented. The diversity of the speakers and their topics would in itself fill a book, one that I would gladly purchase and use time and time again. If knowledge is power, then that filled dining hall had to have been glowing with such intensity as to alert alien civilizations searching for intelligent life to yell "CONTACT!"

Boy, I had a good time. I want to thank myself for finally deciding to go! I want to thank all the astronomy enthusiasts who attended and who are the finest folks found ANYWHERE! I want to thank all the IRC'ers (IRC is Internet Relay Chat, a real-time chat feature of the Internet) that came by and said "Hello!" and didn't have to hit the "Enter" key! (samia, nye, TomP, RayTracer, DeepSky, and other's!). By the way, we did manage to have a live IRC session from the dining hall during RTMC on sunday and thanks again to the RTMC folks! If you're not on Channel #astronomy on IRC, you're missing alot! I want to thank that one person who threw the snowball into the pool and really made it an astronomically special weekend!

Sorry that I did not cover more of the astronomy angle of the conference, but earlier reports have been great on that, and hey, this is amateur astronomy, and I love it! But I digress. Clear Skies To All, even if it snows in May.

[Originally posted to sci.astro.amateur, Doug is an SJAA member - Ed.]

Houge Park Star Party, May 24

by Mark Wagner

It rained. Well, sorta.... but I'll get to that later.

The tennis courts were done and the fence around the new lawn was down, so we all set up on the grass. It was lumpy, and had some 1" gaps, but all in all it was pretty good.

By 7:30, we already had a good crowd. We looked at the moon, then as soon as it was visible, Venus. Eventually the stars appeared. It was obvious that for a Houge Park star party, the sky was going to be very transparent and everybody would enjoy themselves.

We had easily 100 people there from the public, and at least 15 telescopes. I had just moved off Venus and was beginning to show M13 when.... around 9:30....

whooooooooosh..... the sound of, what was it? Rushing air? YES!@!!!!

Where is it coming from? Why was everyone running? YIKES!!!!! SPRINKLERS!!!!!

The crowd scattered while scope owners tried to get their equipment out of the way of flying water bullets. I escaped unharmed, but I hear rumor the Bill O took many hits. 100 people or more crowded onto the sidewalks. Within minutes, car headlightes were blazing and a river of vehicles were outward bound.

Some of us set our scopes up in the parking lot. Others left theirs set up on the sidewalk. I showed M92, M3, M5, Alberio, M57, the blinking nebula, M81 & M82, M51, M4, M80 and M104. Those who braved the elements enjoyed these sites under what was a very nice sky, but the party was over. More or less a rain-out.

By 11:00, everyone was gone, except Rich Neuschaefer and Gil Chin, who stayed until the other park sprinklers came on at 1 am.

Thanks to Paul Barton, Ed Voss, Rich, Jim Bartolini, Gil, Rod Norden, Tery Kahl, John Hales, Paul Graves, the new owners of the green CEO 10" (sold by Rod Norden), and assorted unamed others for coming out. Seems like RTMC wasn't the only star party to get rain this weekend!

TSP, continued from page 1

couple fellow amateurs were able to glimpse stars down to mag. 8.0 naked-eye on the morning of the 12th. I could only go as far as 7.4 direct and 7.7 with averted vision, but who's complaining! I've looked at skies from much higher altitudes, but the lack of oxygen to the retina and brain always prevented me from seeing stars dimmer than about 7.0, so TSP at 5500 feet easily provided my personal best.

Many constellations were difficult to recognize because of all the extra visible stars. I definitively nailed Pluto for the first time, which at mag 13.7 was still very difficult with a 10" but made possible by these skies. Omega Centauri was barely 10 degrees above the southern horizon, but what a glorious sight! The dark skies extended to the horizon, so views of low objects were still outstanding.

Just before dawn, I picked off the Helix Nebula with a Lumicon O-III filter at low power even though it was skimming the eastern horizon. I also got a chance during the week to view NGC 5139 through a "yard scope" (36") as well as through 20" (!) binoculars.

Speaking of the O-III filter, that was definitely the hottest accessory at TSP. By the end of the week there were plenty of used Deep-Sky, Ultrablock, and UHC filters available, with everyone instead clamoring to get an O-III if they didn't already own one. M17 (Swan Nebula), M8 (Lagoon), M27 (Dumbbell), and particularly the Veil Nebula looked spectacular at low-to-moderate powers through this filter. Using my 10" at 71X (35mm Panoptic + O-III), I was able to follow both long arcs of the Veil (NGC 6960 and 6992) through all its swirling filaments, myriad wisps, twists and turns; the amount of detail visible was truly incredible. Prior to the TSP I had seen only very faint, vague nebulosity; here it appeared starkly beautiful, very high contrast, and comparable to the very best photos I'd seen anywhere.

As opposed to transparency, seeing was fairly unremarkable, usually topping out at about 200X. Fremont Peak and other west coast sites often have better seeing, but the transparency and contrast of galaxies and nebulae on the best 3 nights at TSP were awe-inspiring and untouchable by my viewing experiences in California.

Most people functioned well on 2-3 hours sleep after the first day or two; going strong and chatting away till dawn. Many who are well-known to the amateur community were there including Al Nagler (extremely approachable and enthusiastic, introducing a new Televue 5.5" refractor), Brian Skiff (interesting talk on sunspot numbers and possible relationship to climate), Jason Ware, and Alan Hale (co-discoverer of comet Hale-Bopp). Hale-Bopp was distinctly visible at about 7th magnitude, with a coma supposedly already larger in diameter than our sun! I could see about a 10-minute long fan-shaped tail to one side. Since it is still over 4 AU distant, its performance thus far is very promising and raising comparisons to the Great Comet of 1811. Hale's current prediction is that Hale-Bopp will reach magnitude -2 by late March 1997 and likely have a long tail of much higher surface brightness than that which characterized Hyakutake.

Several of us worked-in a daytime side-trip to the area around Big Bend National Park, the Rio Grande, Terlingua (ghost town that's the site of the annual world champion chili festival), and Lajitas. Lajitas is a tiny town on the U.S. side of the Rio Grande whose "mayor", Clay Henry, is a large goat that climbs up a slab of rock to photogenically guzzle down bottles of beer offered by tourists, then comes over to the fence to gaze at you with puppy dog eyes that say "please Sir, can I have another Bohemia?" Truly amazing sight - I laughed so hard I got the hiccups!

Another highlight was earning a "Certificate of Participation as an Element of the CADABBR-SPTT (Community Array, Dermal Aperture, Broad-Band Receiver - Single Photon Philosophical Telescope) during the probable receipt of a believed photon from one of M31's intelligently inhabited planets". All accomplished onsite at TSP under broiling sun with bare chests (or other exposed skin) pointing towards M31 and with the help of bagpipes, drum, and appropriate techno-cosmic sermon (you had to be there!). Heat, dusty winds and sleep deprivation were just another challenge that made TSP that much more memorable. Yes, my well-staked/well-covered scope and Sierra Designs tent survived a West Texas dust devil one afternoon that knocked over several scopes and lifted someone's 8x10 tent filled with over 100 pounds of gear and supplies clear off the ground and carried it over 30 feet before depositing it torn and upside down in a heap.

If one wanted to talk and breathe astronomy during all 22 waking hours each day, there was plenty of opportunity with fellow enthusiasts; if you wanted to explore the region or other interests with your fellow TSP'ers, i.e. what common (or uncommon!) bonds pull amateurs to the night sky and specifically this place, there was that opportunity too. I met up with a great group of guys from the Astronomical Society of South East Texas (ASSET) who generously shared their shade and lots of great conversation and Texas bull under the custom 10-foot square canopy they had constructed. It was a chance to make great new friends with similar interest in the overhead universe and the world around us. I found the Texas Star Party a richly rewarding experience under glorious night skies and am already making plans to attend TSP '97 on 4-11 May next year!

If any of you have specific questions about anything to do with TSP, please don't hesitate to email me at gjmalyj@ucdavis.edu.

In Memory of Tom Waineo

Tom Waineo, professional optician and a source of guidance and inspiration to countless ATMs, died suddenly in his home in Bradenton, Florida. Tom was 60 years old, and recently retired. For the past year or so, he has been making mirrors for amateurs, and writing about optics for various magazines. He was always very generous with his time, and he will be greatly missed. Our deepest condolances to his family.

Texas Star Party
by Brian Skiff

I spent four nights/three days at TSP (Wednesday pm through Sunday am, 15-19 May). There were about 650 attendees (nearly a full house), with a full program of viewing and talks plus plenty of west Texas fellowship.

Of the four nights, two were what I call "spectroscopic", with variably thin cirrus, and the other two were "photometric", i.e. cloudfree. Except for a few hours one night, the seeing was fairly soft, in the 1.5-2" range, really too soft for critical deep-sky viewing. The star party site on Prude Ranch lies in a shallow wash or canyon, and suffers either from cool air draining down the canyon from higher terrain, or warm air flowing up-canyon, so the star party site isn't in a favorable location in this regard.

The two photometric nights had transparency and sky brightness typical of true-dark sites, and my limiting naked-eye magnitude was the usual 7.2-ish using a photometric sequence of stars in Coma Berenices. I guided Houston amateur Susan Spore somewhat fainter than I myself could see in this sequence: she went without a hitch down to a star of V mag. 8.0 here. (I would specify the locations of stars without telling her the magnitude from about 6th on down.) As far as I know, no one looked in the "Nash sequence" in the head of Draco---generally by the time it was up high we were distracted by the rising Milky Way. Louis Binder may have got some folks to try for it, but I don't know the details.

A substantial number of obscure objects were seen for what was probably the first time. Experienced observers Barbara Wilson and Larry Mitchell used their large telescopes (50cm and 90cm, respectively) to view some remarkable objects. The energetic Jay "The Kid" McNeil also found some nice targets with his 40cm, particularly very faint planetary nebulae. As an example, for the last few years I have been making a photometric study of the central star of the planetary nebula Longmore-Tritton 5 in Coma (it is the mag. 9 star HD 112313 plotted on Uranometria at 12 55 34 +25 53.5---but no planetary nebula symbol), but had never seen the actual nebula, which is about 5' across and peaks at a surface brightness near mag. 25 per square arcsec (barely recorded on the old POSS-I prints). It was a marginal object in Jay's 40cm, but not more than ordinarily difficult in Larry's 90cm, using a UHC filter in both cases.

Among other sights:

the outer halo of M57, which was visible without a filter in Larry's 90cm, and showed radial filamentary structure with an OIII filter;

the tendrils of the Egg Nebula in Cygnus using a 63cm telescope, which I had seen previously only as a faint double star in my 15cm refractor;

NGC 6540, recently identified as a globular cluster, and nearby NGC 6520 looking quite stunning together with the dark cloud Barnard 86;

the obscure (and obscured) globular cluster AM-4, looking not only brighter than catalogued, but partially resolved in Barbara's 50cm;

another obscure/obscured globular, Tonantzintla 2 in southern Scorpius;

the new Earth-approaching asteroid 1996 JA1, which many TSPers observed on both Friday and Saturday nights. The real-time motion in the eyepiece, looking like a slow-moving satellite, was faster than Hyakutake;

the large oval outer halo (about 25'x15') of NGC 5128, which was easy to see in a set of 25x150 Fujinon binoculars (Howard Brewington spent a few hours with these one night scanning for comets as well);

the recent x-ray nova GRO J1655-40, which appeared as a mag. 14 star deep in Scorpius.

This last target was provided by Craig Wheeler, supernova theorist from UT-Austin, who was the Saturday evening speaker. Other speakers included Dennis diCicco, who gave a first-rate presentation about the relative merits of CCDs and photography (a talk about CCDs that barely mentioned hardware!), and Alan Hale, whose subject matter was the obvious one. Lots of other good talks during the afternoons as well by amateur observers on a wide range of subjects, mostly centered on deep-sky observing rather than telescopes or hardware.

By strolling around the two telescope fields I was able to look through a variety of instruments. I was pleased that none were aimed at the standard showpiece objects (e.g. M51, M57, M13, omega Centauri) when I came up, but instead were doing Herschel 400 lists and the like. So I viewed instead mag. 11 and 12 galaxies, which from a dark site show plenty of detail even in a 25cm telescope.

Not a one of the telescopes larger than 30cm (12 inches) aperture that I happened to look through was sharp, mostly suffering from astigmatism. The big Newtonians were sufficiently astigmatic that their crummy images were evident even in poor seeing. Since the telescopes were left out in the blazing west Texas Sun each day and weren't necessarily collimated perfectly, it is difficult to blame the primary mirrors alone. But one got the impression that even cooled-down and lined-up, these telescopes would never be really sharp. Between the heat, poor mirror supports, careless collimation, non-rigid tube assemblies, and so on, there's plenty room for blame. The two best telescopes I saw other than high-end refractors were (are you ready?) an old Meade 25cm f/6 "research grade" Newtonian, and a 25cm Meade Schmidt-Cassegrainian. Some of the subarcsecond seeing was going on when I viewed through these, so it was easy to discern their optical quality. Both had sharp, contrasty optics and did their owners proud.

It was difficult to disuade the many hangers-on lusting after Larry's 90cm Obsession (most were clearly beginners) that this telescope is major work to deal with in terms of transport, set-up, and use, not to mention risking your neck getting up to the eyepiece while precariously balanced on the top steps of a 4-meter ladder. I look at it and think that for the same money I'd prefer a 40cm f/8 Cassegrainian with good optics instead.

An interesting sign o' the times at TSP this year was the computing

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Back Yard Astronomy
Mark Wagner
June 7, 1996
Los Gatos, CA

What a great way to spend a Friday evening. After a week of wilting heat, the weather changed bringing the night temp at 10pm to a nice 70F with clear fairly steady skies with reasonable in-town transparency. My kids (Daniel, 11 and Mimi, 8) prompted me to let them look through my 10" f/5.6 dob tonight, since they are not accompanying me to Fremont Peak tomorrow night.

I started off looking at M13, Daniel and Mimi's favorite. Our dark adaptation was not very good yet, but the cluster was easy to locate and resolved well with a 20mm wide-field. I enjoy this eyepiece so much I decided to use it exclusively during the night. From M13, we jumped north to M92. It is easy to find as well, between two well placed bright stars. It looked much more condensed than M13, but lacked in size by comparison. I then tried for the planetary ngc6210 in Hercules, which if I had charts outside, would have been easy to locate (but, my charts were inside past the lights of my family room, so.... no charts). 6210 is such a beautiful turquoise blue when conditions are right....

Next, over to Leo, beginning to set in the west. M65 and M66, faint, for sure, but there they were. Nice size with the 20mm, and the near identical pa's make them a nice pair. I kept asking myself if I could actually see ngc3268(?) by them, but I think I'd be fooling myself if I did.

Hmmm... what next? Up to... why not.... M51. Yeah, it is supposed to be just a couple small fuzzy eyeballs looking back in the city, but it really shown well for in-town. For those who asked about tricks to locate it, I make a triangle with Alkaid (the end star in UMaj's handle, and the just visible (in town) star Canes Ven 21. M51 is almost at a perfect triangle's position away from Alcor/Mizar. The cores of the galaxies were obvious, and there was clearly some arm structure showing. It was not dark enough, and my aperture was not large enough to make out any distinct dark lanes.

As long as we were around Canes, I moved to M63. My kids were having a ball with this stuff. Soon, a discussion about the possibility of stars no longer being there, although we see them, and the topic of ET's was in full swing. Too bad we were missing I Love Lucy reruns for this idle chatter! ;-)

M63 was bright compared to M51. Easy to identify, even for my 8 year old.

But soon, Mimi decided she was getting tired, and went off to bed, leaving Daniel to continue observing with me.

I moved the scope to another corner of my backyard to get a better view of Lyra. M57 was a nice sight, even though it sat just above my neighbor's Altar To The Electric Light (all lights on in the back of their house, as usual). My son looked at the Ring and said we could place a paper "hole reinforcing ring" on the secondary and nobody would know the difference....

I moved to the double-double (Epsilon Lyra) for a quick peek, wondering what I could see at 71x. At first it looked like a single-single, but upon close inspection it became obvious that there were two components to each single. Not split, not even a figure eight, but certainly it was noticeable that they were not single point sources.

Now, with Scorpius rising sufficently, I popped in M80. I was surprised how bright it was (I guess my dark adaptation had finally arrived) compared to what I remembered. A nice bright small ball. Remembering Bill Arnett's comments about M4, I next swung over and found myself agreeing with him that it was very loose, and thought it certainly could be mistaken for a dense open cluster. No sign of the ngc globular just off Antares though.

Now, Daniel was being overtaken by the long school week of and the excitement of his pending summer vacation. He said goodnight and went inside.

I began searching for M5, but failed. A star chart would help, but my dark adaptation was too nice to lose now. Geesh.... I know about where it is, but I just hunted for a bit and thought.... why not move into Ophiuchus instead. Do I remember where M12 and M10 are? Well, M12 came into view with a quick peek through the Quickfinder and a small nudge at the eyepiece. I thought it looked similar to M4... perhaps larger, but it did not look dense to me. Still, a very nice sight. Where was M10? I got lucky and plopped down right on it. :-) Now, this glob, although supposedly very similar to M12, was significantly larger and denser to my view at that moment.

For a finale, I pointed the scope almost straight up... there.... between Arcturus and Cor Caroli... to M3. What a magnificient sight to finish up on. This is easily one of my favorite objects! Large, dense, to me it rivals M13 (my real favorite globular is M22 in Sag, especially in a bit larger scope...).

All in all, it was an enjoyable evening for me, and my kids. And, it shows how even in town, with its associated light dome and well-lit neighbors, one can find a dark spot in the yard and get in a very relaxing and rewarding hour of observing.

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San Jose Astronomical Association
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power available on the telecope field. It was the usual thing for people to have no paper charts out, but instead to just use a 486 laptop with MegaStar running. I imagine as the next step the ranch will have to lay an Ethernet system around the field so everyone can have Web access to call up SkyView images and do searches in NED and SIMBAD while observing. The paperless observing table has arrived!

Lunar Prospector Spacecraft Construction

[Courtesy of Lockheed Martin Space Company (LMSC)]

Sunnyvale, May 20, 1996 -- Construction and assembly of the Lunar Prospector spacecraft that will return the United States to the Moon is proceeding on schedule for an October 1997 launch.

Lunar Prospector is the first peer-reviewed, competitively selected mission in NASA's new Discovery series of "faster, better, cheaper" solar system exploration missions. It represents the implementation of NASA's new way of doing business, focusing on minimizing risk and cost, rapid turnaround time and delivery of science data. The Lunar Prospector mission was proposed as a joint effort of LMSC and NASA Ames Research Center, along with important other contributions from Los Alamos National Lab, UC Berkeley Space Science Lab, NASA Goddard Space Flight Center, and a few others. These institutions have built scientific instruments for the mission at a tiny fraction of the usual cost.

Overall management of the Lunar Prospector program is the responsibility of principal investigator Dr. Alan Binder of LMSC. "The strength of this program is that we discuss issues as they arise, on the spot, and get them resolved in a very short time. We don't have the problem of requirements coming in from afar that the engineers are stuck with. This is a great way to build a spacecraft."

"Lunar Prospector is a terrific little spacecraft whose strength is its simplicity," continued Binder. "I think we've done a marvelous job in the way it was conceived and the way we've implemented the whole thing."

"Lunar Prospector is serving as a pathfinder in many different ways," said NASA mission manager Scott Hubbard of NASA Ames. The mission "is making history in terms of management style, technical approach, cost management and focused science. The only way to do a tightly cost-constrained program is to let the contractor focus on doing the job, take responsibility for it, and not have to respond to a shadow organization," he said. "It requires insight rather than oversight. However, we do pay close attention to the progress of the program and involve NASA in any areas which have the potential to delay schedule, raise cost or significantly degrade the science return. NASA is the customer for Lunar Prospector data and the Mission Office has the responsibility to safeguard the public's interest." Additionally, NASA Ames has the responsibility to carry out navigation, analysis, tracking and the organization of the operations center.

According to project manager Tom Dougherty of LMSC, all hardware and subsystem procurements are nearing completion, actual spacecraft components are under construction, scientific instruments are approaching final readiness and assembly and testing are about to begin. The current schedule calls for static and dynamic structural testing in May and June, structural modifications through July, plumbing in August, wiring and hardware installation in September and full-up system tests beginning in October.

"We're extremely pleased with our progress," said Dougherty. "We've put a detailed program in place and we're meeting the schedule and maintaining cost control. The key to our approach is to put together a small, collated, multi-talented group, with close ties to the customer, namely the principal investigator, so that decisions can be made in real-time."

The spacecraft is a small, spin-stabilized vehicle with a fully fueled mass of 513 pounds. It is 4.6 feet in diameter, 4.1 feet in axial length drum with solar cells mounted on its outer surface which provide 206 watts of power. During a one-year polar orbiting mission, it will map the Moon's surface composition, gravity and magnetic fields, and volatile release activity. Six scientific instruments are mounted on three booms to isolate them from the bus and simplify the spacecraft-instrument interfaces. The experiments were chosen for their scientific value, ability to be flown on a simple, spin-stabilized spacecraft, and low mass, power and data rate requirements.

A gamma-ray spectrometer will provide global maps of the elemental composition of the Moon's surface layer. Knowledge of the concentrations of such elements as uranium, thorium, potassium, iron, titanium, oxygen, silicon, aluminum, magnesium and calcium will aid in understanding the composition and evolution of the lunar crust.

A neutron spectrometer will be able to locate as little as one cup of water in about a cubic yard of lunar soil (regolith). The discovery of lunar polar ice would mean that water, necessary for life support and as a source of both oxygen and hydrogen to produce rocket propellant, would be available in situ to future lunar explorers.

An alpha particle experiment will provide information on the level of tectonic and volcanic lunar out-gassing activity. It will map the locations and frequency of radon gas release events on the Moon, thought to be tectonically and volcanically dead until Apollo.

A magnetometer and electron reflectometer will map local lunar magnetic fields, which are weak compared to Earth's global magnetic field. This will help to determine the origin of such fields and may provide information on the size and composition of the lunar core. An indication of the Moon's economic potential may result.

The Doppler gravity experiment will provide the first complete gravity map of the Moon, essential for planning follow-on unmanned and manned lunar missions. It will also provide data on density differences in the crust, internal densities and the nature of the core.

After launch, Lunar Prospector will take four days to reach the Moon, making two midcourse maneuvers, deploying booms, and collecting calibration data via its science instruments en route. Once the spacecraft reaches the Moon, it will be put into a circular, 118-minute, 63 mile altitude, polar-mapping orbit to begin its mission.

If fuel is available at the end of the one-year nominal mission, lunar mapping may be extended at lower altitudes over areas of special interest. When the fuel needed for orbital maintenance is depleted, the spacecraft will impact on the lunar surface.

Early Findings from Tethered Satellite Mission Point to Revamping of Space Physics Theories

Jerry Berg

Marshall Space Flight Center, Huntsville, AL

Numerous space physics and plasma theories are being revised or overturned by data gathered during the Tethered Satellite System Reflight (TSS-1R) experiments on Space Shuttle Columbia's STS-75 mission last March.

Models, accepted by scientists for more than 30 years, are incorrect and must be rewritten. This assessment follows analysis by a joint U.S.-Italian Tethered Satellite investigating team of the information gathered during the mission.

During STS-75, a tether system was being unreeled to nearly 13 miles above Columbia's payload bay. Just short of the full distance, its tether broke. Nevertheless, the science instruments on the satellite and Shuttle, which had been operating during the five hours of deployment operations, sent a flood of readings that were received and recorded by scientists on the ground. "Even the quick-look made to date reveals that this data harvest is rich in content," said Dr. Nobie Stone, NASA TSS-1R mission scientist at the Marshall Space Flight Center, Huntsville, AL.

"Perhaps the most significant finding," Stone said, "is that tether currents proved to be up to three times greater than existing theoretical models predicted prior to the mission. With the amount of power generated being directly proportional to the current, this bodes well for technological applications."

"Reversing the direction of current flow puts the system into an electric-motor mode," Stone explained. This harnessed energy could furnish thrust for reboosting a space station, satellite or Shuttle in a decaying orbit.

"Traditionally, the primary source of power for long- term space platforms has been solar arrays," Stone said. "Those cells can only produce power when exposed to sunlight during the two-thirds of each 90-minute orbit when a space station, for instance, is not on Earth's dark side. However, a tether system might provide a constant source of energy," he noted. "It is very efficient and might serve as an effective back up power system."

Other important revelations from the STS-75 mission include observations of the satellite's thrusters interacting with the ionosphere while moving rapidly in Earth orbit. Stone said that, when the thrusters were fired to adjust the satellite's spin rate, the neutral gas emitted became ionized.

The tethered satellite researchers noted that, at that point, "a sudden jump" took place in the level of current flow, while the satellite's potential (voltage) dropped several hundred volts. They traced this effect to the small amount of gas, released from the thrusters, becoming ionized in the vicinity of the satellite. A greater, more efficient current flow was observed. "The effect of neutral-gas ionization is not taken into consideration by existing theoretical models of current collection in the ionosphere," Stone said.

Also, for the first time ever, the high voltage plasma sheath and wake of a high-voltage satellite moving rapidly in the ionosphere was measured. "This is virtually impossible to study in a laboratory and is difficult to model mathematically," Stone said.

Tethered Satellite System investigators have just begun to scrutinize the data from STS-75. They expect that it will reveal more answers to questions about the workings of the Earth's upper atmosphere, its physics and the electrodynamic applications of tethered systems in space.

Temperature in Space

Craig Berry

Temperature in space is a very tricky concept. Temperature is a measure of the average energy of the particles (molecules, ions, whatever) in a substance. In a (perfect) vacuum, there are no particles, so there is no temperature.

Of course, space is not a perfect vacuum. There is a constant stream of ionized particles from the Sun, and an interstellar medium beyond the heliopause. These extremely thin media have a wide range of temperatures; some are extremely hot (thousands of Kelvin). However, they contain very little *heat* per unit volume (a measure of thermal energy density), because there are so few particles. Standing in a 3000 K interstellar gas cloud would *not* make you very warm. :)

Large objects in space achieve a temperature at which their heat input and output rates match. Heat inputs are largely from nearby stars or planets; heat output is through blackbody radiation, proportional to the fourth power of temperature. Heat input is also strongly influenced by the albedo and extended geometry of the object; consider that the unoccupied and underpowered Skylab got uncomfortably warm in Earth orbit, while the occumpied but almost unpowered Apollo 13 got uncomfortably cold at nearly the same distance from the Sun. Similarly, surface rocks on Earth reach temperature maxima of around 330 K, while on the airless Moon they reach 450 K.

Finally, there's the question of the microwave background. Effectively, all of space is suffused with a bath of radiation having an effective temperature of 3 K. As a result, even out between the galaxies, far from any star, you won't find any natural object with a temperature lower than that.

[Craig posted this to sci.astro in response to a request. When I asked him if I could copy this, he wrote: "I grew up in San Jose and Los Gatos -- I'm in L.A. now. I remember attending an SJAA star party when I was about 10 (it was a close Mars opposition), and still recall my incredible excitement that I was surrounded by *real live astronomers* and *great big telescopes*. It's nice to be able, in some small measure, to return the favor." -Ed.]

COMET COMMENTS
by Don Machholz

Comet **Hale-Bopp (C/1995 O1)** is now visible to the unaided eye- at least to some eyes. The rest of us will have to be content with binocular views of the comet for a while longer. This comet will likely be a naked-eye object for more than a year, the Northern Hemisphere will see it through mid-May, 1997. This affords an opportunity to conduct an experiment, and to set a personal record: for how long you can follow the comet without optical aid. In 1985-6 Halley's Comet was seen for about seven months, and early in the last century the Great Comet of 1811 was a naked-eye object for about nine months. Simply record the first night you view Comet Hale-Bopp with the unaided eye, and, sometime next May, your last naked-eye viewing. The comet is presently 3.2 AU from us and 4.1 AU from the sun.

Meanwhile Periodic Comet **Kopff** is visible in the same part of the sky, but you'll need a pair of binoculars or a small telescope in order to see it. Other comets that we have been watching have now faded or moved south.

C/1995 O1 (Hale-Bopp)

DATE	R.A.	Dec	EL	Sky	Mag
00 UT	2000				
06-26	19h01.5m	-12°23'	165°	M	6.4
07-01	18h54.7m	-11°53'	168°	M	6.3
07-06	18h47.7m	-11°23'	168°	E	6.2
07-11	18h40.5m	-10°54'	165°	E	6.1
07-16	18h33.3m	-10°24'	160°	E	6.0
07-21	18h26.0m	-09°55'	154°	E	5.9
07-26	18h18.9m	-09°26'	149°	E	5.8
07-31	18h12.0m	-08°59'	142°	E	5.7
08-05	18h05.5m	-08°32'	136°	E	5.7
08-10	17h59.4m	-08°07'	130°	E	5.6

22P/Kopff

DATE	R.A.	Dec	EL	Sky	Mag
00 UT	2000				
06-26	19h20.7m	-17°28'	165°	M	7.0
07-01	19h21.7m	-18°03'	169°	M	6.9
07-06	19h22.3m	-18°41'	174°	M	6.9
07-11	19h22.7m	-19°22'	177°	E	6.9
07-16	19h23.2m	-20°04'	175°	E	7.0
07-21	19h23.8m	-20°45'	171°	E	7.1
07-26	19h24.8m	-21°25'	166°	E	7.2
07-31	19h26.2m	-22°03'	162°	E	7.3
08-05	19h28.2m	-22°36'	157°	E	7.4
08-10	19h30.8m	-23°05'	153°	E	7.6

Orbital Elements

Object	Hale-Bopp	Kopff
Peri. Date	1997 04 01.14561	1996 07 02.1998
Peri. Dist (AU)	0.9140971	1.5795617
Arg/Peri (2000)	130.59227°	162.83487°
Asc. Node (2000)	282.47087°	120.91329°
Incl (2000)	089.42807 °	004.72143°
Eccentricity	0.9950784	0.5440739
Orbital Period (yrs)	3000	6.45
Source	MPC 26879 (3-26)	MPC 22032 (1991)

Celestial Calendar - July 1996
by Richard Stanton

Lunar Phase	time (utc)	date	rise (pdt)	trans	set
FM	01:37	01	21:02	01:21	06:37
LQ	18:56	07	00:27	06:53	13:26
NM	16:16	15	06:09	13:18	20:22
FQ	17:50	23	13:38	19:16	00:12
FM	10:36	30	20:26	01:03	06:33

Mercury Dist: 1.32AU. Mag: -1.8

date	rise	trans	set	RA	Dec
07	05:27	12:55	20:32	06:46.2	+23:59
17	06:30	13:47	21:03	08:18.1	+21:30
27	07:28	14:24	21:18	09:35.3	+15:54

Venus Dist: 0.45AU Mag: -5.4

07	03:49	10:50	17:51	04:45.8	+17:42
17	03:23	10:25	17:28	05:00.1	+17:52
27	03:06	10:11	17:16	05:24.7	+18:34

Mars Dist: 2.28AU Mag: +1.2

07	03:48	11:10	18:32	05:05.2	+23:02
17	03:36	11:01	18:25	05:35.1	+23:27
27	03:26	10:51	18:16	06:04.7	+23:51

Jupiter Dist: 4.20AU Mag: -2.7

07	20:08	00:59	05:46	18:54.2	-22:56
17	19:24	00:15	05:01	18:48.7	-23:04
27	18:40	23:26	04:16	18:43.8	-23:10

Saturn Dist: 9.16AU Mag: +0.8

07	00:30	06:35	12:40	00:30.7	-00:46
17	23:47	05:56	12:02	00:31.2	-00:46
27	23:08	05:17	11:22	00:31.0	+00:42

SOL Star Type G2V Intelligent Life in System ?

07	05:51	13:13	20:34	07:07.2	+22:32
17	05:58	13:14	20:30	07:47.9	+21:08
27	06:06	13:14	20:22	08:27.6	+19:07

Astronomical Twilight		Begin	End
JD 2,450,271	07	03:59	22:26
JD 2,450,281	17	04:09	22:18
JD 2,450,291	27	04:21	22:06

Sidreal Time

Transit Right	07	00:00	=	17:54
Ascension at	17	00:00	=	18:33
Local Midnight	27	00:00	=	19:13

Darkest Saturday Night:	July 13
Sunset	20:32
Twilight End	22:22
Moon Rise	05:43
Dawn Begin	04:05

Telescope Loaner Program Status
by Paul Barton

No.	Scope Description	Borrower	Due Date
1	4.5" Newt/P Mount		**available**
3	4" Quantum S/C	Albert Chen	7/22/96
6	8" Celestron S/C	Albert Lee	8/11/96
7	12.5" Dobson	Tim Sanstrom	7/9/96
8	14" Dobson		**available**
9	C-11 Compustar	Ed Voss	indefinite
15	8" Dobson	Bob Elsberry	7/9/96
18	8" Newt/P Mount	Jerry Lovelace	6/6/96
19	6" Newt/P Mount	Stephen Shoup	8/8/96
21	10" Dobson	Jacob Anderson	7/4/96
23	6" Newt/P mount		**available**
24	60mm refractor	Sridhar Lakshmikanthan	8/25/96
26	11" Dobson	John Linthicum	7/14/96
27	13" Dobson		**available**
28	13" Dobson		**available**

All scopes are available to any SJAA member. Call Paul at 377-0148.

Pioneer 10 & 11 Status Reports
Status Updated: 24 May 1996
NASA

Pioneer 10
(Launched 2 March 1972)

Distance from Sun (1 June 1996): 64.73 AU
Speed relative to the Sun: 12.5 km/sec (27,962 mph)
Distance from Earth (1 May 1996) : 9.86 billion kilometers (6.13 billion miles)
Roundtrip Light Time: 18 hours 17 minutes
Active Instruments:
1) Charged Particle Instrument (CPI)
2) Geiger Tube Telescope (GTT)
3) Ultraviolet Photometer (UV)

The spacecraft is healthy and continues to send back valuable scientific observations from the outer regions of our Solar System. The available electrical power on the spacecraft is insufficient to continue operating the Cosmic Ray Telescope (CRT) instrument. The CRT was dropped from the list of active instruments on 16 May 1996.

Pioneer 10 will pass through Superior Conjunction on 8 June 1996. (The Sun will be in line with the spacecraft, as viewed from Earth). The minimum Sun-Earth-Spacecraft angle will be 3 degrees. There will be some degradation of the received signal from 5 June to 11 June due to Solar interference.

Pioneer 11
(Launched 5 April 1973)

Distance from Sun: 45.72 AU
Speed relative to the Sun: 12.24 km/sec (27,380 mph)
Distance from Earth: 6.70 billion kilometers (4.16 billion miles)

Pioneer 11's mission has ended. Its RTG power source is exhausted.

The last communication from Pioneer 11 was received in November 1995, shortly before Earth's motion carried it out of view of the spacecraft antenna.

The spacecraft is headed toward the Aquila (The Eagle). Pioneer 11 will pass near the closest star in Aquila in about 4 million years.

Astro Ads

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Dave 408-946-8563

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Rich (w)408-285-0730

Orion 12.5" Premium (Deluxe) Reflector. Accessories include a scope bag (carrying case), scope cap (dust cap). It is six months old (I am in the process of purchasing a larger telescope). $900 obo for everything. New price from Orion with the added accessories would run around $1200.00. It is clean throughout. NO eyepieces are provided. The one it came with fell to the Earth and well, you know what happened.
Glenn Dawes (415) 812-8822

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