

# Sonoma Skies

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

[www.sonomaskies.org](http://www.sonomaskies.org)



July 2007

Volume XXX No. 7



*Crepuscular rays above 45 telescopes at the Bryce Canyon NP Astronomy Festival. —Photo by Jane Houston Jones*

## CREPUSCULAR RAYS AT BRYCE ASTRONOMY FESTIVAL 2007

by Jane Houston Jones

A few weeks ago Mojo and I toured some of our great Western National Parks and Forests and participated in their public star parties. To us, there is nothing better than when sidewalk astronomy collides with National Park dark skies. Here is a view we saw as we were setting up our telescopes on the last night of the Bryce Canyon National Park Astronomy Festival. Crepuscular Rays! A 2-day old moon, and Venus are also visible in the image if you look carefully.

Crepuscular rays are rays of sunlight that appear to radiate from a single point in the sky. These rays, which stream through gaps in clouds, are diverging columns of sunlit air separated by darker cloud-shadowed regions. Dust, small aerosols and moisture droplets scatter light to make the sun's rays visible and cloud and mountain shadowed air dark by comparison. Various airborne compounds like smoke particles scatter the sunlight and make these rays visible. The reason we see the light so defined is because of diffraction, reflection and scattering.

Crepuscular rays are near-parallel, but appear to diverge because of linear perspective. They often occur when objects such as mountain peaks or clouds partially shadow the sun's rays like a cloud cover.

Although the Sun's rays strike the Earth almost parallel to one another, we see them appear to come from a point because of

*(continued back page)*

## Meteors—Visitors from Outer Space

SCAS July 11 Meeting, Proctor Terrace School

Ten years ago, Al Stern had the pleasure of attending the Stellafane Star Party in Springfield, Vermont, an event he helped to organize for many years.

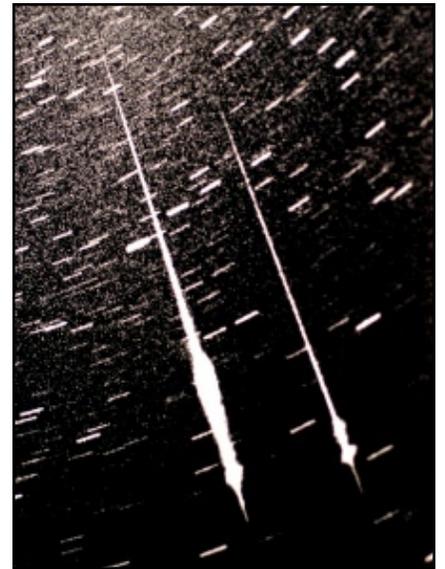
The keynotespeaker was Sam Palmer of Harvard Smithsonian Center for Astrophysics, where he is a radio astronomer working in the 1.2 Meter Telescope Group. Sam, an Electronics Engineer, is also a Smithsonian Astrophysical Observatory lecturer at Harvard University.

The subject of his talk at Stellafane was meteors, what we know about them and how we came to know the information (i.e. some of the tests done to gather the information), which makes the talk really fascinating. He has a good sense of the public

and a good sense of humor as well. The 57-minute presentation was videotaped and the quality of some of the images is not great; however, the message and the words come through clearly.

Come and prepare to be fascinated and amused as you learn about the objects that are raining on our planet at an estimated rate of 100 to 1,000 tons per day.

Note too that this year's Perseid meteor shower comes on Monday, August 13 at New Moon, with an expected peak at 1:00 AM. Now, this year's shower is not predicted to be anything out of the ordinary, but after watching this video you'll enjoy every flash in the sky that you witness even more.



*Len Nelson took this image during the Perseid shower on 8-12-94 at Lake Sonoma. It was a 4.5 minute exposure on TMax 3200. The 2 meteors shot through the frame about 30 seconds apart. This image was published in both Astronomy & S&T magazines.*

Young Astronomers See page 6

# Sonoma County Astronomical Society (SCAS)

## Membership Information

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

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

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

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

**Egroup URL:** Connect with other members about going observing, observing reports and chat about astronomy and news items from AANC and *Sky & Telescope*. Hosted by Robert Leyland at [r.leyland@verizon.net](mailto:r.leyland@verizon.net). Any SCAS member is welcome to join. Visit <http://groups.yahoo.com/group/scas> and click the "Join" button, or send an email to [scas-subscribe@yahoogroups.com](mailto:scas-subscribe@yahoogroups.com)

**Discount Subscriptions:** For *Sky & Telescope*, new subscribers may send a check for \$32.95 payable to "SCAS", with your complete mailing address, directly to: Larry McCune, 544 Thyme Place, San Rafael, CA 94903. 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.

**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 10 days prior to the end of each month.** Mail to: Editor, SCAS, P.O. Box 183, Santa Rosa, CA 95402, or email [publications@sonomaskies.org](mailto:publications@sonomaskies.org)

## SCAS Elected Board

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## SCAS Appointed Positions

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**Striking Sparks Program Coordinator:** Larry McCune  
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[sfollett@sonic.net](mailto:sfollett@sonic.net)

**Librarian:** Joan Thornton 762-0594 [johnjoanthornton@sbcglobal.net](mailto:johnjoanthornton@sbcglobal.net)

**Visit us on the web at:**  
[www.sonomaskies.org](http://www.sonomaskies.org)

# July Observing Notes

- 7/1 Venus 0.66° SSW of Saturn
- 7/4 Winter Solstice on Mars
- 7/7 Last Quarter Moon, 9 PM
- 7/9 Moon near Mars, 4 AM
- 7/14 New Moon, 5 AM
- 7/15 Venus near Regulus and Saturn, 9:30 PM
- 7/16 Moon near Saturn, Regulus and Venus, 9 PM
- 7/20 Mercury greatest elongation W, 8 AM
- 7/21 First Quarter Moon, 11:30 PM
- 7/29 Full Moon, 5:48 PM

## Observing Treats

**Venus:** On July 15, go out early to try catching a 3.2% thin crescent moon. It will be about 7° above the horizon about 7° north of due west. Use binoculars to spot it a few minutes after 9 PM. Then, at 9:30, you should be able to see Venus near Regulus and Saturn. The next night, July 16, the crescent moon will be near Saturn, Regulus and Venus.

**Mars** continues to gain prominence in the morning sky. By the end of the summer it will be rising before midnight and it approaches its long-awaited opposition in December.

**Asteroid Vesta** is still brightly visible (for binoculars or scopes) in Ophiuchus during early July (see last month's newsletter).

**(Editor's Note:** Of course, summer is our best time for observing globular clusters, the Virgo galaxies, the nebulae and dark lanes of the galactic center in and around Scorpius and Sagittarius. Pack up that telescope, get out to a dark spot, and spend as much time as you can enjoying our spectacular skies!)

—*Most observing information courtesy of Jack Welch*

## FREE TELESCOPE

I have an old 10" reflector telescope on a German equatorial mount that I would like to give to someone who is willing to restore it.

The mirror is of excellent figure, but the silvering is pretty much gone. Re-silvering it would get you a wonderful mirror. The motor on the mount has frozen up. It may just need cleaning, or it may need re-winding.

I am including the two eyepieces and a Barlow. The eyepieces are both orthoscopic and in pretty good condition. The base is very heavy and stable. It can be moved and set up by one person (I have done it myself many times).

I have owned this scope since the late 70's, and have gotten much enjoyment out of it. It is a very well-made scope. If anyone at the Astronomical Society would like it, it is free. Otherwise I will list it on Craigslist or eBay for a small sum.

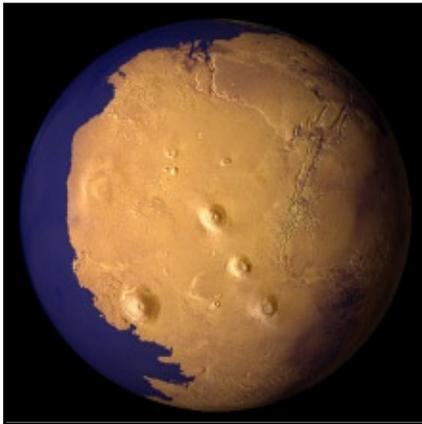
Please contact me, Chris Dunkle, at [cdunkle@sonic.net](mailto:cdunkle@sonic.net)

# NASA Research Supports Presence of Large Oceans on Early Mars

MOFFETT FIELD, Calif. - NASA-funded astrobiologists at the University of California, Berkeley have discovered evidence supporting the presence of large oceans of liquid water on early Mars.

One of the most obvious surface features on Mars is a large plain surrounding the north pole that resembles a sediment-filled ocean basin with shoreline-like features. But the purported shoreline isn't level, an observation that has been used as an argument against the presence of an ocean. This new study shows that the undulations can be explained by movement of Mars' spin axis, and thus its poles, and that a liquid water ocean could indeed have existed there. The scientists' research is scheduled to be published in the June 14 issue of Nature magazine.

"This work strongly supports the idea that there were large standing bodies of water on the Martian surface," said Carl Pilcher, director of the NASA Astrobiology Institute at NASA Ames Research Center, Moffett Field, Calif., which co-funded the study. "Interpreting this topography as an ancient northern ocean could have a great impact on current and future Mars exploration," he added.



"When the spin axis moves relative to the surface, the surface deforms, and that is recorded in the shoreline," said study co-author Michael Manga, a professor of Earth and planetary science at UC Berkeley, and member of the NASA Astrobiology Institute Team there. "On planets like Mars and Earth that have an outer shell or lithosphere that behaves elastically, the solid surface will deform differently than the sea surface, distorting the topography," added primary author Taylor Perron, a former UC Berkeley graduate student, now a postdoctoral fellow in Harvard University's Department of Earth and Planetary Sciences. Perron's calculations show that the resistance of the elastic crust could create elevation variations for topographic features like the shoreline, in accord with observations.

Perron, Manga and their colleagues calculate that on Mars, an initial shift of 50 degrees from today's pole would be sufficient to disrupt the shoreline. Manga theorizes that the shift that precipitated the tilt of Mars' rotation axis is related to the presence (and great mass) of an ocean at one of the poles. If a

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## SOCIAL AMENITIES

At last month's meeting Benita Lorentz brought cherry pie, muffins and coffee, and Len Nelson brought cold drinks and water, and all of it went fast! Thanks to you both.

You can sign up to provide refreshments at a meeting, too. It's easy! Just contact any Board member and choose a month.

## WELCOME NEW MEMBERS!

Welcome aboard to Marc Berger of Santa Rosa, David Lazzareschi of Larkspur, Martin & Amal Edwards of Healdsburg, and Christopher Spitzka of Folsom.

## SILENT AUCTION

Bring any astronomy-related items you wish to sell to a SCAS meeting. Another member might be looking for that very thing!

COMING TO SCAS IN AUGUST

**STAR-B-QUE**

SEE PAGE 5

# Events

## ROBERT FERGUSON OBSERVATORY

### PUBLIC VIEWING

**Saturdays, July 7 and July 14**

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

Night Viewing begins 9:00 PM

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

**Fees:** No admission fee for the solar viewing, but donations are appreciated. The Park charges \$6 per vehicle for entry. A \$3 donation is requested from adults 18 and over for admission to the observatory during night viewing sessions.

### NIGHT SKY SUMMER SERIES

Session #4—Tuesday, July 10, 7:30 PM

Session #5—Tuesday, July 17, 7:30 PM

Each class includes a lecture on the constellations of the season, their history and mythology, and how to find objects within them. Learn the bright stars, deep-sky objects, and visiting planets of the spring skies. After each presentation (sky conditions permitting), enjoy a review of the constellations in the actual night sky and learn how to find them for yourself. Viewing through telescopes follows.

**Fees:** \$75 for the series of six presentations. (Single session fee is \$23). 10% discount for VMOA members. Classes are held at the Observatory.

### OBSERVING LAB

**Friday, July 13, 8:00 PM**

“Binaries and Multiple Stars”

Observing Labs are one-night events centered around an intensive telescope observing experience based on that session's theme. After an informative presentation of about 40 minutes, attendees will head to various telescopes for a night of docent guided observing.

Attendance is very limited in order to assure that everyone can get both significant eye-time on the telescopes and lots of personal docent guidance. We will provide informative handouts, plus observing lists of objects selected to illustrate the night's topic. Our goal is for you to see these cosmic wonders in a new way, noticing details that are usually overlooked and appreciating what is actually taking place in the objects you are viewing. We want to “open your eyes and your mind” in these labs!

**Fees:** \$30 per person per event (\$27 for VMOA Subscribers).

For information or to register: (707) 833-6979,  
<http://www.rfo.org> or [nightsky@rfo.org](mailto:nightsky@rfo.org)

## SCAS AT YOSEMITE

The first weekend of August is about one month away. As of this writing, the following members have signed up to represent SCAS on Glacier Point in Yosemite on Friday and Saturday, August 3 and 4: Marc Berger; Walt Bodley; David Cranford; Terry Dye; Dan Gunyan; Benita Lorentz; Phil Marshall; Larry McCune; Len Nelson; Bill Romo; Don Spitzka; John Whitehouse; and Dickson Yeager. It is not too late to add your name to the list—email me at [astroman@sonic.net](mailto:astroman@sonic.net). If you are on the list and have made a change in plans and will not be going this year, please let me know.

Len Nelson has forwarded to me a set of guidelines for Yosemite participants that includes the fee waiver page. These “guidelines” also contains a list of likely targets, Iridium flairs and any ISS fly-overs that I will need to update as we get closer to the actual date.

The Park Service will provide five campsites with the following conditions: No more than 6 people per site and no more than two vehicles per site. We currently have 13 individuals or family groups on the sign-up list, so there is a likelihood that those who go on this trip will need to secure additional campsites (\$14 per night) for the overflow. I will not be going to Yosemite, but four of the SCAS Board members will be there to assist in the running of things. It is hoped that at least one person or group will be at the Bridalveil campground prior to noon on Friday (maybe even Thursday) when the vacant campsites become available on a first come-first served basis so that Larry will need to write only one reimbursement check. Look at the list of participants and maybe contact one or more of them regarding car pooling or sharing of campsites to help the group leaders know how many extra campsites will be needed.

If you're not going to Yosemite, remember August 4 is also an RFO Solar and Public Night. Since many of the “SCAS to Yosemite” participants are also RFO docents, the observatory will be needing volunteers.

—Lynn Anderson

## MT. TAMALPAIS ASTRONOMY

**July 21, 8:30PM: “Weighing the Dark Matter in the Universe with Gravitational Lensing”**—Dr. Joseph F. Hennawi, UC Berkeley. A description of the mysterious problem of Dark Matter in the Universe which has confounded astronomers and physicists for nearly half a century, and recent progress on understanding it based on one of the predictions of Einstein's theory of general relativity.

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

# Events

## SCAS COMMUNITY OUTREACH: PUBLIC ASTRONOMY FOR JULY & AUGUST

Even though school is out for the summer, there is still a call for volunteers to do star parties for scout groups and summer programs.

On **Tuesday, July 17** I will be doing a one-person star party for the Children's Village in Santa Rosa.

On **Thursday, July 19** there is a need for telescopes in Sonoma at the El Verano Elementary School. The summer program is called Common Bond and is composed of two "camps", one of English-language learners and one of Spanish-language learners. I will be giving a PowerPoint presentation, there will be a pot-luck dinner and then viewing of the almost first quarter moon, Jupiter and the brighter summer sky objects.

On **Thursday, August 2**, we have been asked to help about 80 Cub Scouts work toward their Astronomy Belt Loops. This will be taking place at Rincon Valley Park in Santa Rosa between 3:15 and 7:00.

There are three requirements for the scouts to earn their belt loop:

1. Set up and demonstrate how to focus a simple telescope or binoculars
2. Draw a diagram of our solar system; identify the planets and other objects
3. Understand the following terms: planet, star, solar system, galaxy, the Milky Way, black hole, red giant, white dwarf, comet, meteor, moon, asteroid, star map and universe.

Ironically, the event, called a "Twilight Camp," ends before sunset and the waning gibbous moon doesn't rise until around 10:30, so there won't be much to look at. What I have suggested is that we might find several volunteers with different types of telescopes (a reflector, a refractor and a Schmidt-Cas) to explain the optics, demonstrate how to focus the telescopes and allow each scout the opportunity to sight and focus the telescope on a distant object. I will be out of town on this date and I need to let the organizer know if we will be able to accommodate her request as soon as possible.

Finally, I am developing a three-fold brochure to describe our service to the community which the Sonoma County Office of Education will print for us and distribute to all of the public school teachers in Sonoma County. If any of you have photos of our volunteers at a star party to be included in such a publication, please forward those to me. I am especially hoping to have a photo of a line of telescopes. If it includes children looking through the eyepieces, all the better. We may have to stage such a scene. If so, we'll do that.

If you can help with any of the events listed above, contact me via email at [astroman@sonic.net](mailto:astroman@sonic.net)

—Lynn Anderson

## SCAS Star-B-Que August 18

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 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.

**Times and what to bring:** We are allowed in at noon. Solar viewing will begin at 2 PM. See the 24" reflector in the daylight and have your photo taken with it! 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:** Adjacent to 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. The Star-B-Que is intended 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 [lennelsn@comcast.net](mailto:lennelsn@comcast.net) if you have questions. Hope to see you there!

**Reminder:**  
**Don't forget to renew your  
SCAS membership!**

# Young Astronomers



## WHAT TO DO THIS SUMMER

Here are some tips for how to play with your telescope this summer. It's our best time for observing globular clusters, the nebulae and dark lanes (like the Pipe Nebula) of the galactic center in Scorpius and Sagittarius, and much, much more.

One great way to learn the sky is to focus on a single constellation and wander around until you find something that catches your eye. See if you can identify the object using your planisphere or a sky chart. Keep notes of what you see, noting the date, time, the eyepiece you used, what the sky was like, anything that stands out to you. The very best thing is to draw what you see. As you try to draw (especially in the dark!) you will see more and more, and your ability to differentiate will become refined. Stick with it—everyone finds this awkward in the beginning! Artists learn this about observation when they spend time drawing in nature—that close observation teaches you much more than someone else's descriptions. Despite what you might have heard, artists and scientists have a LOT in common!

For neighborhood viewing, remember that if you point your scope higher overhead you'll be looking through less atmosphere (and less ambient light), and you'll get your clearest views. The later you stay up, the darker the sky (people turn their lights off).

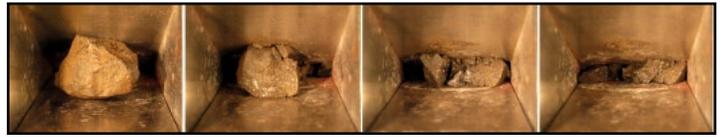
One more thing: Each Sparks winner has a "mentor," meaning that you can ask your mentor for help with your telescope, or with viewing questions—or anything related to astronomy. Whether you won your scope this year or ten years ago, please don't hesitate to ask for help. Your mentor signed on for that job!

A great observing spot is Lake Sonoma. Amateur astronomers from all over the Bay Area use this location because of its dark skies, though it is near a park road and headlights occasionally intrude. Plan to arrive well before sunset so *you* don't disturb other astronomers with *your* headlights. Take Dry Creek Road west from Highway 101 at Healdsburg, continue several miles to the dam, continue past park headquarters, up the hill, keep right, and go across the bridge. Go to the third parking area on the right after the bridge (it's called Lone Rock Flat). Find a spot, settle in, find north, set up your scope, and then wander around to see what other people are doing. Star parties there are very spontaneous. You never know how many people will show up. Be respectful and quiet, and you'll no doubt find someone who will just love to share their knowledge of the sky with you.

Think about coming to the SCAS Star-B-Que (see page 5) on August 18, too. Bring your scope and all your questions. Lots of astronomers will be there to assist you.

I hope these tips help you enjoy your summer under the stars.

—Cecelia Yarnell



Looking down on the jaws of the Mars Rock Crusher, we see a magnetite rock get crushed into smaller and smaller particles.

## NASA SpacePlace

### Chew on This

The Mars robotic rovers, Spirit and Opportunity, are equipped with RATs, or Rock Abrasion Tools. Their purpose is to abrade the surface patina off the Mars rocks so that the alpha x-ray spectrometer can analyze the minerals inside the rocks, rather than just on the surface.

But future robotic missions to Mars will be asked to go even further below the surface. Scrapers and corers will gather rock samples of substantial size, that, in order to be analyzed by a spectrometer, will need to be crushed into a fine powder.

Crushing rocks on Mars? Now there's a problem that brings to mind a multitude of possible approaches: Whack them with a large hammer? Squeeze them until they explode? How about just chewing them up? It was with this latter metaphor that the planetary instrument engineers struck pay dirt—so to speak.

Thanks to NASA's Planetary Instrument Definition and Development Program, a small group of NASA engineers came up with the Mars Rock Crusher. Only six inches tall, it can chew the hardest rocks into a powder.

The Mars Rock Crusher has two metal plates that work sort of like our jaws. One plate stays still, while the other plate moves. Rocks are dropped into the jaw between the two plates. As one plate moves in and out (like a lower jaw), rocks are crushed between the two plates. The jaw opening is larger toward the top and smaller towards the bottom. So when larger rocks are crushed near the top, the pieces fall down into the narrower part of the jaw, where they are crushed again. This process repeats until the rock particles are small enough to fall through a slit where the two plates are closest.

Engineers have tested the Mars Rock Crusher with Earth rocks similar to those expected to be found on Mars. One kind of rock is hematite. The rusted iron in hematite and other rocks help give Mars its nickname "The Red Planet." Another kind of rock is magnetite, so-called because it is magnetic. Rocks made by volcanoes are called basalts. Some of the volcanoes on Mars may have produced basalts with a lot of a mineral called olivine. We call those olivine basalts, and the Rock Crusher chews them up nicely too.

Visit [www.jpl.nasa.gov/technology](http://www.jpl.nasa.gov/technology) to read the latest about other NASA technologies for exploring other planets and improving life on this one.

—Article was written by Diane K. Fisher and provided by JPL/NASA



The ISS, followed by Atlantis, in this time exposure. See if you can spot the 2 trails.

## Caught on Camera: Atlantis and the ISS

by Len Nelson

**Tuesday, 6/19/07 at 10:36 PM - transit of the Space Shuttle and the International Space Station after they separated:**

I was really hoping to get an image of this transit from the RFO, but the fog situation looked pretty bleak. After I gave the “Moon” presentation at the Night Sky class my wife, Charlotte, and I headed off to the Geysers at about 9:10 PM and arrived at a turn-off above the valley at 10:05 to wait under beautiful clear skies.

While waiting, I practiced by assuring that I had the camera focused on the stars and that a 1-minute exposure would be about right for the sky conditions. My camera was mounted on a standard photography tripod and I employed a cable release so that I would not have to touch the camera and possibly cause vibrations. I tried to aim my camera so that I'd get the last one minute of the transit with the image trailing off into the Earth's shadow but I underestimated how high 72 degrees was. Anyway, I knew that it would come by Ursa Major so I assured that I had it well posed and that was what I used as my guide and took some practice shots to assure that all was working as planned and in focus. I used my Nikon D80 with an 18-135 zoom set to 18mm at F3.5 for 60 seconds at ASA 500.

In retrospect (hind sight is oh sooo clear, isn't it?) **I wish I had done a hat trick midway though the transit to show that the 2 objects were *not* side by side, as the trails imply, but separated by about 1-2 finger widths held at arm's length.** But, at that time, I expected it to die out in our shadow at the top of my field of view.

I do wish that could have happened. Instead, it faded into the Earth's shadow about another 25% of the trail's length as seen in this image.

It was a really memorable experience and Charlotte and I are quite happy that we made the effort to find a location with clear skies to witness this spectacle.

Sonoma Skies, July 2007

## Liquid-Mirror Telescope on Moon Might See Deeper Back in Time

NASA-AMES, JUNE 21, 2007: Someday, astronauts on the moon may pour liquid onto a disc-shaped mesh to make a huge mirror for a powerful telescope, according to a technical article just made public.

The liquid would include a silver-coated surface, and would be part of an optical-infrared telescope with a 66-foot (20-meter) to 328-foot (100 meter) aperture capable of observing objects 100 to 1,000 times fainter than the James Webb Space Telescope, the authors say. The technical paper will appear in the June 21, 2007, issue of the journal, *Nature*.

“In this case we have shown how the moon is ideal (for) using liquid mirror technology to build a telescope much larger than we can affordably build in space,” said S. Pete Worden, director of NASA Ames Research Center in California's Silicon Valley, and a co-author of the technical paper. The lead author is Ermanno Borra, Laval University, Quebec, Canada. “Such telescopes, perhaps 100 meters in diameter can see back to the early phases of the universe after the Big Bang,” Worden added.

The authors envision making lunar, infrared telescopes to study normal and dwarf galaxies. “The lunar, liquid-mirror project was supported by the NASA Institute for Advanced Concepts. It enabled a team of scientists including myself to show how the moon—our first target in the Vision for Space Exploration (VSE)—might support astronomy,” Worden explained. “We hope that this or similar possibilities will excite the scientific community about the opportunities contained within the VSE,” Worden observed.

According to the article, an uncoated mirror would be carried to the moon in a drum that astronauts would empty into a rotating mesh, robotically unfolded like an umbrella.

“Surface tension would prevent the liquid from falling through the small holes of the mesh,” the authors said.

The major advantages of liquid telescope mirrors include ease of shipping, assembling and maintenance, “which are far easier than for a solid mirror,” the authors note.

In laboratory experiments, the researchers used a liquid made of ‘ionic salts’ that remains fluid at very low temperatures. The scientists deposited a fine layer of chromium particles on the liquid and then added a layer of silver particles. The researchers say that the reflectiveness of the liquid mirror is not yet adequate, but “it is now only a matter of technological improvement.”

The authors say they will continue to experiment to develop more ways to make liquid mirrors. The researchers predict that the first lunar, liquid-mirror telescope will be built no earlier than 2020.

Borra received a grant from the Canadian Space Agency to conduct his studies. The other authors include: Omar Seddiki of Laval University, Quebec, Canada; Roger Angel and Daniel Eisenstein, both from the University of Arizona, Tucson; Paul Hickson, Univ. of British Columbia, Vancouver, Canada; and Kenneth Seddon, The Queen's University of Belfast, U.K.

## ***Crepuscular Rays*** *(from Page 1)*

perspective—at a distance, parallel lines seem to converge, like railway lines disappearing over the horizon.

We also saw the anticrepuscular beams in the East. These rays appear to converge towards the antisolar point - the point in the sky directly opposite the sun. But I was so taken with the view of the moon and Venus in the crepuscular rays that I forgot to take that other picture!

### **Links to National Park Astronomy:**

AANC 2007 Glacier Park Star Parties: <http://www.aanc-astronomy.org/yosemite.html>

Bryce Canyon Astronomy Festival and dates through September 2007: <http://www.nps.gov/brca/planyourvisit/astronomyprograms.htm>

Grand Canyon Star Party 2007 and beyond: <http://www.tucsonastronomy.org/gcsp.html>

National Park star party pictures from 2007: <http://photo.whiteoaks.com/2007-06-grand-canyon/>

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## ***Oceans on Mars*** *(from Page 3)*

flood of water had filled an ocean at the northern pole on Mars about 3 billion years ago, its mass might have been enough to shift the pole 50 degrees to the south. Once the water disappeared, the pole could have shifted back.

Manga also said the source of the water, while unknown, may have produced a flood or deluge greater than any that have been observed on Earth, evidenced by huge canyons in the flanks of the Tharsis rise, site of the solar system's largest volcano. The water may have evaporated, but it may also have sunk back into underground dikes, frozen near the surface but possibly liquid below.

The NASA Astrobiology Institute (NAI), founded in 1997, is a partnership between NASA, 16 major U.S. teams, and six international consortia. NAI's goal is to promote, conduct and lead integrated multidisciplinary astrobiology research and to train a new generation of astrobiology researchers.

For more information about the NASA Astrobiology Institute, visit: <http://nai.nasa.gov/>

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## ***Sonoma Skies*** **July 2007**

JULY 11

Al Stern

**Meteors—Visitors  
from Outer Space**