

# starry nights



October, November, December 2003

Volume 23, Issue 4

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## Martian Encounter

With the opposition of Mars this past quarter, the Wehr Astronomical Society (WAS) received large turnouts of the general public at our regular observing sessions. Tim Grunewald, WAS Observatory Director, also arranged two public observing sessions dedicated to the observation of Mars on the night before and night of (Tuesday and Wednesday, August 26 and 27) the opposition of the red planet. There were large crowds despite the many other events for the Harley Davidson 100<sup>th</sup> anniversary. Each night brought crowds of approximately 100 people. Fortunately, many members volunteered their time and telescopes for the special weekday events.



Adam Machajewski

Although the conditions were not perfect for both nights, Mars still was magnificent through the telescope thanks to its unprecedented 25 arc second diameter. People of all ages, small children and adults alike, observed the ice cap and some other easily recognizable large surface features. On Tuesday, we dodged clouds for the duration of the night and were even greeted with a surprise rain sprinkle. A high dewpoint, temperature, and amount of mosquitoes made the night even more uncomfortable. Wednesday, we were greeted with a considerably lower dewpoint and cooler temperatures making for a more comfortable and enjoyable night.

If you have not observed Mars through a telescope yet, it's not too late. Mars will remain fairly large in the eyepiece, 15 arc seconds by the end of October; it will also be rising earlier and more convenient for observers who prefer observing early. Everyone is always welcome to come to our observing sessions (see page 8), to stop by and take a look at Mars before it is gone!

-Adam Machajewski



## W.A.S. News and Information

### MEMBER HIGHLIGHTS

Our non-profit status is something we would like to promote to the community for our fund raising plans. We have received our first donation from one of our members, Phil Schmacher and the company he works for Cooper Industries, who matched his donation. The club wants to thank Phil and his company for their generous donation.

### BAADER SOLAR FILM NOW AVAILABLE

Our club has purchased a large sheet of Baader Solar Film for making solar filters for astronomical equipment. We are going to be selling smaller pieces to our members. One suggestion for buying a piece is to make solar filters for your finderscope or binoculars, which is an extra safety precaution we sometimes forget, when showing our friends the sun. If anyone is interested, contact our Observatory Director, Tim Grunewald.

### SUGGESTIONS FOR CHRISTMAS GIFTS

The club offers Membership Gift Certificates for friends and relatives as an idea for that extra special gift. If you are real generous, you can include a magazine subscription too. If interested, fill out a new membership form, include your check, your telephone number and information as to how you want the certificate to be handled. Send to the address on the form. New membership forms can be picked up at Tuesday meetings or Friday observing sessions.

### THANKS TO A VOLUNTEER

A special thanks to Greg Zuchowski who has been our membership coordinator and newsletter duplicator for the past 13 to 15 years. He is passing on the duties to other club members.

### PAINTING DONATED

Recently the widow of Bruce Bond donated one of his astronomical paintings to our club. Bruce was involved with the designing of our club logo. He was a very talented artist and a member for over 10 years. The painting may be displayed at the Wehr Nature Center if they find a spot for it. We want to thank Mrs. Bond for her gift.

## Robert Powell is accepted into NASA's Saturn Observation Campaign

Robert Powell, of the Services Continuity department, has been accepted in NASA's Saturn Observation Campaign (SOC). Rob is one of only six people from Wisconsin and 169 across the U.S. that have been accepted into the international program.

SOC members live across five continents and probably have little in common, other than their passion for sharing their love for space observation. They hold meetings in cities and rural areas alike, and show the common person how beautiful the ringed planet really is.

The Saturn Observation Campaign is an endeavor of NASA's Jet Propulsion Laboratory to create opportunities for professional and amateur astronomers to engage the youth groups, school children, and the public at large in the excitement of astronomy, using telescopes and the Cassini-Huygens Mission to Saturn.

The campaign gives astronomers an opportunity to share their knowledge and passion for space exploration with their communities. Partnering

### W.A.S Board of Directors and Officers

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### Wehr Astronomical Society

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\* Signifies the position is available and the name represents the acting volunteer. Contact a board member if you are interested in the position.

with local organizations, volunteers will use their imagination to hold fun and educational activities, whether by organizing viewing events, giving lectures, or coordinating hands-on activities.

Campaign participants are planning events right now. To participate in a viewing event, or to host a Saturn viewing at your school, youth, or community event, locate the SOC participant closest to your local community. <http://saturn.jpl.nasa.gov>

This program is sponsored by NASA's Cassini Mission. The Cassini spacecraft will arrive at Saturn on July 1, 2004, where it will begin a four-year tour of the Saturn system.



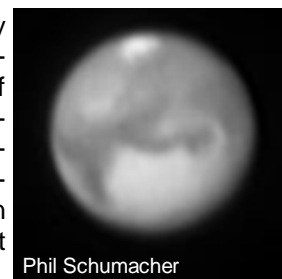
## Photographing Mars with a CCD Camera

"Now is our winter of discontent made glorious summer by this planet Mars" (to misquote Shakespeare). As is well known, Mars was at its closest approach in centuries this summer, so it was a good time to try for a permanent record of it. The planets are fairly difficult subjects to image, due to the high magnifications and steady skies required to get a decent result. Also, Mars is fairly low in the sky (about 30 degrees above the horizon), resulting in a lot of atmosphere between it and our telescopes.

I've succeeded in getting several nice images Here's how it was done: I use an astronomical CCD camera which is useful for both planetary and deep-sky images (see the first quarter newsletter for a description). To get good planetary images, the size of the image needs to be matched to the resolution of the telescope, and the size of the CCD pixels. I used my 6" f/6 telescope with a 5X Televue Powermate magnifier to achieve an effective f/30 optical system. The pixel size of my camera is 7.4 microns (.0074 mm). The result is that each pixel spans 0.3 arc-seconds of sky. My telescope has a theoretical resolution of 0.75 arc-seconds, so each pixel is about 1/2 the resolution of the telescope, which

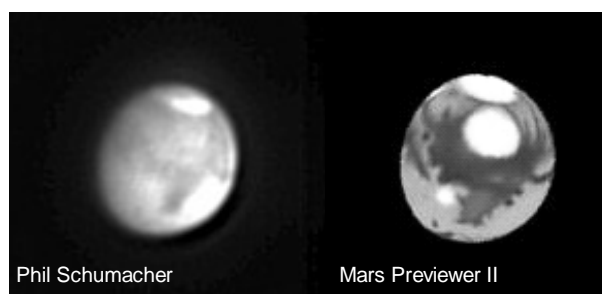
is considered near optimum for planetary imaging. This gives Mars a size of about 60 pixels on the CCD chip.

In my experience at planetary imaging, the best results are obtained by taking a large number of images and averaging them together. The result is then sharpened by various processing methods. A raw image taken on September 4th at about Midnight is shown at right.



Phil Schumacher

The camera software I use can be set up to take a number of images in rapid succession. Because Mars rotates, the total time span for all the images to be stacked must be short, less than 3 minutes or so. I took 60 images in about 2 minutes. The sky was fairly steady, and about 50 of the images were good enough to use. These were aligned and stacked together using the image processing software AIP4WIN. After alignment, the same software was used to sharpen the image and increase contrast to bring out subtle detail. The final result is below at left. To the right of it is a diagram from the Mars Previewer II software for the same time and date which shows the major details.



Phil Schumacher

Mars Previewer II

I think the similarity is readily apparent. The South Polar Cap is the white area at the top of the image; Syris Major is the dark peninsula near the bottom left and Sinus Sabaeus is the long thin arm reaching to the right. I am happy with the detail visible in the image. I have several more that can be seen on my web site at:

<http://my.execpc.com/~philsch/Astrophotos/Astro.htm>

-Phil Schumacher





### PLUTO (and KBOs)

In preparation for the scheduled launch of the Kuiper-Express probe to Pluto-Charon--and Kuiper-Belt Objects (KBOs) in 2006, for arrival at Pluto in 2015--astronomers are giving more attention to the far-distant planetary pair with their VLTs (Very Large Telescopes,) resulting in more discoveries in the last year than have been made in the last several decades.

One such determination: the evidence of continued "global warming" on Pluto since its closest approach to the Sun in 1989, has revealed that the Plutonian atmosphere has not even begun cooling, let alone freezing out as a surface frost, despite receding from the Sun's warmth for the last 14 years. Instead, the miniscule atmospheric pressure has actually tripled over that time, resulting in a "stark temperature rise--for Pluto," as one astronomer put it.

It is just possible that some kind of volcanic activity--in the form of nitrogen plumes such as seen by Voyager 2 on Neptune's KBO-like satellite Triton--could be responsible for the heating of the surface.

Moreover, findings of "spikes" in temperature and density indicate the presence of strong winds in the tenuous atmosphere. Presently the South Pole is sublimating its frozen nitrogen as Pluto experiences mid-spring in that hemisphere, thus contributing more gas to the atmosphere.

However, the trend cannot continue for many years more, since the North Pole is in mid-fall and already in the grip of a 120-year permanent darkness, and its near-zero--Kelvin temperatures are capturing the newly released and wind-borne nitrogen from the south and solidifying it in its ice cap.

### NEPTUNE

As noted above, Neptune's Triton is serving more and more as a model of expected conditions on Pluto, used for preliminary planning for the New Horizon's Kuiper Express. Data from Voyager-2's approach to Triton is being exhumed from decades-old files and subjected to more detailed analysis, to try to determine how the probe should be programmed, and what instruments should be made up for it. Triton is now considered to be a probably captured KBO, a perfect model for the exploration of other KBOs out beyond Pluto that the Kuiper Express will hopefully discover.

Meanwhile, a new estimation of the mass of the Kuiper Belt's Objects suggests that the early Solar System could have formed another Neptune-mass-sized planet from it, except that something disturbed the KBO planetary swarm and kept it in fragments--possibly a passing star or brown dwarf.

### URANUS

This multi-mooned (21 at last count) gas giant continues to roll its South Pole towards Earth in its 84-year-long orbit, making its rings and moons much more visible on end to Earth's Hubble and VLTs which are taking advantage of the improved viewing conditions to analyze them, especially the polar regions of the moons which normally can't be seen directly by Earth telescopes, and the broad-on surface plane of the rings.

As for the latter, a theoretical explanation is being given to a puzzle about them: why are Uranus' rings (11 in all,) so very dark, while Saturn's are so very bright? Both are made up of ice particles, so why the variance? The answer, scientists say, is due to the nature of the "ice": Saturn's are made of water ice, while Uranus' are of methane ice. However, the frozen methane on the surfaces of the Uranian rings' particles is being broken down by electron radiation into dark-colored carbon compounds, an effect known as radiation darkening. (Neptune's few ring arcs are also very dark, and probably experiencing the same effect.)

### SATURN

The Cassini spacecraft is still operating fine, and on schedule to enter the Saturnian system next year in July; shortly after that, it will release the Huygens probe which will descend down onto the surface of Saturn's largest moon Titan.

Meanwhile, VLT explorations of Saturn's largest moon Titan are revealing detailed facts about it in advance of what even Cassini will discover.

Despite the heavy hydrocarbon haze that shrouds the moon, (with ten times more mass than Earth's much wider atmosphere,) infrared observations through VLTs have determined that the surface of Titan is covered by large regions of ice, while other locations appear to be solid--or even liquid--sediments: organic "glop" that has descended onto Titan's surface for billions of years from the breakup of its methane air destroyed by the Sun's ultraviolet rays, then reacting with other molecules in the atmosphere and rain on down.

The sediments, in both liquid and solid form, could blanket the surface to a depth of an estimated half a mile. There even is a possibility of oceans of ethane--gasoline-- being thus created by some of the reactions.

So when the Huygens probe lands on the Titan surface in late 2004, it might impact on an icy glacier--or just continue on down to the bottom of a quagmire of ooze.

## JUPITER

The Galileo probe, finished with its mission to the Jovian system, was deliberately plunged into the clouds of Jupiter on September 21, thus bringing to an end a "Space Odyssey" of 14 years duration that began with launch in 1989.

Meanwhile, a new puzzle--and possible solution--has arisen concerning all the newly discovered Jovian moonlets--now at a total of 61--which have been found to be overwhelmingly in retrograde orbit around Jupiter. Being probably captured asteroids from the Belt, the question remains:

Why should retrograde-traveling objects be more susceptible to capture than those going in the same direction--prograde--as the gas giant? The solution proposed: Asteroids and moonlets in a normal, prograde orbit are chaotic and tend to travel precariously close to their new host planet. There they stand a greater chance of being destroyed by collisions with other moons, or plunging down into the planet. Retrograde moons don't tend to get as close and so are more likely to survive. Thus Jupiter has captured many more prograde asteroids--but has swallowed them up.

## MARS

Many new theories are being proposed about Mars' climate as the result of new Mars Odyssey Orbiter (MOO) and Mars Orbital Surveyor (MOS) observations, in tune with the recent closest approach of Mars to Earth in August:

One holds that Mars never had the major oceans and lakes that many scientists believe occurred in its ancient past. This is because the latest MOO data interpretations indicate only a small (3%) accumulation of magnetite--a magnesium carbonate mineral--on the surface. Since carbonates form as a result of carbon dioxide in the atmosphere coming in contact with surface water, the tiny amount of magnetite makes some conclude there never could have been large water surfaces. To bolster this theory, so far no evidence of limestone cliffs has been discovered, which would have been the natural result of carbonates precipitating out of eons-long oceans. Ocean-protagonists dispute this conclusion, saying that both the 3% figure and the science of carbonates forming on Mars are not yet known in sufficient detail.

Most scientists do agree that the cliff and crater-wall erosions found in the MOS pictures prove that some kind of flowing liquid carved them; the debate rises as to whether it was liquid water or carbon dioxide that caused it. If the latter was the cause, some conclude that it was bursts of the CO<sub>2</sub> in all three physical forms--gas, liquid, and solid--from underground that erupted and eroded the surfaces; (they liken the result to that of a shaken soda bottle that when releasing its contents can erode surfaces by jet action.) Ocean-believers hold that that kind of sporadic action isn't long-lasting enough to result in all the massive cliff erosions seen today.

Yet another theory being given credence takes into account the massive amount of Martian craters, mostly in the southern hemisphere. This holds that over the eons Mars has suffered several cataclysmic impacts from very large asteroids thrown at it by Jupiter. When these hit the Martian surface, the stupendous energy released caused both molten rock vapor and superheated steam to erupt from the planet and fill the thin atmosphere to a much denser pressure; these super-hot materials then rained down all over the planet, causing flash flooding and erosion of valleys. The thicker atmosphere also allowed surface water to exist and flow for a limited period of time.

Others use periodic volcanic eruptions to project the same scenario; however, the volcanoes existing today are more than tens of millions years' old, so they could not have caused the wet conditions to occur relatively recently.

Whichever theory might prove correct, the duration of this "wet Mars" would have lasted only a few decades, or maybe a century at a time, before the planet then refroze. This cycle could have occurred several times more in interludes of tens of millions of years, so that instead of a slow and steady warming/cooling cycle on Mars, the planet would have been subjected to periodic see-sawing of the climate between frigid and torrid, all at the whim of Jupiter's gravity meddling with the Asteroid Belt.

### LUNA

A renewed interest in our Moon has prompted NASA to ask for a New Frontiers spacecraft (the new generation of inexpensive probes,) to be launched to the South Pole Aitken Basin--where cometary ice is suspected to exist in its perpetual shadows--land, retrieve samples of the surface, and return to Earth. This would take place some-time later this decade.

If ice is found in the perpetual dark region of the Basin, future probes could be expected, including Rovers. The difficulties are that the polar and high-walled Aiken Basin is out of Line-of-Sight (LOS) to Earth's receiver arrays. However, although out of LOS to Earth-based dishes, the Aitken Basin would be in LOS with an Earth-orbiting geosynchronous satellite, since such satellites at their 22,000-mile-high orbits would be far enough out to triangulate on a probe deep in the Basin, and thus could relay data down to Earth.

Probes to the Moon take only three days to go and then return, a much shorter time than the years-long probes to the outer planets that have come to be the norm in exploration. Plus, Earth control of any probes or Rovers on the Lunar surface takes only three seconds round trip--even through satellite relay.

### EARTH

The disaster to the Brazilian Space Agency's Alcantara Launch Center in northeastern Brazil in August has wrecked that country's space program. Their VLS-3 rocket was three days away from liftoff with two satellites aboard, when one of its solid-fuel boosters exploded, igniting the

rocket's liquid-fuel main stage, blowing up the remaining boosters and upper stages, killing 21 and injuring 20 more--all technicians--and destroying the launch pad complex, leaving nothing but a huge crater.

This was going to be the latest attempt to launch Latin America's first successful satellite, the two previous Brazilian VLS launches in 1997 and 1999 having crashed on takeoff. Brazil now is negotiating to joint venture with the Ukraine to use one of their rockets at the ideally-positioned equatorial site.

The limited-crew of two on the International Space Station got a Russian Progress supply freighter docked at the end of August; this also carried supplies for the next two man crew which will replace the current two on October 20, when they arrive in a Soyuz vehicle. A Spanish astronaut will ride up with the replacement crew, stay aboard with the combined crews for eight days, and then ride home with the returning first two.

### VENUS

Japan plans to launch its first-ever unmanned space probe to Venus in 2007, with the spacecraft expected to start orbiting the planet in 2009. (This will come after NASA's Venus Express arrives in 2006.)

### MERCURY

The innermost planet has been visited by only one probe, the U.S.-launched Mariner flyby in 1974. Now NASA plans an orbiting probe called Messenger, to be launched in the spring of 2004.

It will not arrive at Mercury however, until January of 2008. In the four-year interim, the spacecraft would conduct two flybys of neighboring Venus, in 2006 and 2007, then do two flybys of Mercury in 2008, before settling into orbit in 2009.

To add to the Mercurian interest, the Japanese and European Space Agencies are planning a joint mission that would be the first to land a probe on Mercury's surface. They plan on employing the Russian Soyuz rockets to launch several probes--including orbiters for communications relay--in about the Year 2010; however, the economical path taken by the probes would only arrive at Mercury four years later in 2014.

- Jay Wichmann





# SCHEDULED ACTIVITIES

FOR

The Wehr Astronomical Society

<http://www.wehrastro.org>

## Regular Meetings

(Free and Open to the Public)



**Tuesday, October 14, 2003 7:00 p.m.**

**Horwitz Planetarium**

**Explorers of the International Space Station:** We will be going to the Horwitz Planetarium in Waukesha, WI.



**Tuesday, November 11, 2002 7:00 p.m.**

**Wehr Nature Center**

**What you need to know before you purchase a telescope for Christmas:** Understanding telescope terminology is difficult. Tim Grunewald, Wehr Astronomical Society's Observatory Director, will help you make sense of it all.



**Tuesday, December 9, 2002 7:00 p.m.**

**Wehr Nature Center**

**When Galaxies Collide:** Lauren Grodnicki, a graduate student of the University of Chicago, will be talking about when galaxies collide.

## Observatory Activities

(Free and Open to the Public)

October 3	7:00	<b>Observing the moon and deep sky objects.</b> See a 1 <sup>st</sup> quarter moon and the brighter deep sky objects. See Mars.
October 17	7:00	<b>Deep sky observing Locate Aquila.</b> the Eagle. See Mars.
November 7	7:00	<b>Observing the moon and deep sky objects.</b> See a full moon and the brighter deep sky objects. See Mars.
November 21	7:00	<b>Deep sky observing.</b> Are Uranus and Neptune binocular objects? See Mars.
December 5	7:00	<b>Observing the moon and deep sky objects.</b> See a near full moon and the brighter deep sky objects. See Mars and Saturn.
December 19	7:00	<b>Deep sky observing Locate the Pleiades.</b> See Mars and Saturn (closest to Earth on Dec. 31st).

Note: All observatory dates fall on a Friday, and are held at Froemming Park.