

# The Stargazer

July 2009

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**The Stargazer**  
 P.O. Box 12746  
 Everett, WA 98206

See EAS website at:  
<http://everettastro.org>

## EAS BUSINESS...

**NEXT EAS MEETING – SAT. JULY 18<sup>TH</sup> 7 PM -  
 AT JIM BIELAGA'S PLACE ON CAMANO ISLAND.**

★★ **Saturday July 18<sup>th</sup> 7:00 pm Pot-luck dinner and star party event** ★★ The July club meeting will be a **Pot-luck Bar-B-Q Meeting & Star Party at Jim Bielaga's place on Camano Island.** (we will not meet at the Aurora Astro Store this month) Observing will begin around 10:00 pm. Star party will follow dinner, weather permitting. If it is too overcast for observing, we expect to have a movie or similar activity. **Attending members will be eligible for a monthly door prize.**

### Location:

612 Manaco Beach Rd  
 Camano Island, WA 98282

### Bing Map to the Location:

<http://www.bing.com/maps/default.aspx?v=2&FORM=LMLTCC&cp=48.157188~-122.516864&style=r&lvl=13&tilt=-90&dir=0&alt=-1000&phx=0&phy=0&phscl=1&encType=1>

### Collimation Clinic:

Bring your telescope for a collimation tune-up during twilight, to be all ready for summer star parties. (Table Mt. Star Party is next week)

### Please RSVP !

Please call Jim at [Aurora Astro](http://www.auroraastro.com) at **425-337-4384** to RSVP (let him know if you ARE coming, or NOT coming), and coordinate WHAT FOOD to bring (Jim will have salad, corn, chips and dip, plates and stuff, and someone is bringing dessert or watermelon.)

### Parking:

You can park at first houses' driveways on right. Jim's house is behind that one.

## ★ STAR PARTY INFO ★

### ★ Scheduled EAS Star Parties at Ron Tam's: ★

Saturday July 18 - at Jim Bielaga's house  
 Saturday August 22  
 Saturday September 19  
 Saturday October 17  
 Saturday November 14

EAS member Ron Tam has offered a flexible opportunity to EAS members to come to his home north of Snohomish for observing on clear weekend evenings and for EAS starparties. Anyone wishing to do so needs to contact him in advance and confirm available dates, and let him know if plans change. *"Our place is open for star parties any Saturday except weekends of the Full Moon. People can call to get weather conditions or to confirm that there is a star party. Our phone number is (360) 568-5152. They can e-mail me too (tam1951@verizon.net) but I don't check my email daily. They can email me for directions if they never have been out here."* Listed below are proposed dates for **planned EAS star parties** at my [Ron Tam's] place, depending upon the weather, of course. Call Ron about spur-of-the-moment observing.

**Please also join the EAS mail list, and then send mail to the mail list at [everett\\_astronomy@topica.com](mailto:everett_astronomy@topica.com)** to coordinate spur-of-the-moment observing get-togethers, on nights when the sky clears. We try to hold informal close-in star parties each month during the spring, summer, and fall months on a weekend near the New moon at a member's property or a local park. (call Jim Bielaga at (425) 337-4384 for info or check the EAS website.) Members contact Jim Bielaga for scope borrowing.

## Other Western US Star Parties This Season

### JULY -

**Jul 15-19, 2009 - Mt Bachelor Star Party (MBSP) 2009**, Mt. Bachelor (Bend) OR <http://www.mbsp.org/>

**Jul 15-19, 2009 - RASCals Vancouver Island Star Party 2009**, Victoria Fish & Game Assoc - Holker Place, Malahat, (Near Victoria) BC, CA <http://victoria.rasc.ca/events/StarParty/>

**Jul 18 2009 - OMSI-RCA Summer Night Sky Star Party**, Rooster Rock State Park & Stub Stewart State Park, OR [http://www.rca-oms.org/sp/sp\\_schedule.htm](http://www.rca-oms.org/sp/sp_schedule.htm)

**Jul 20-25 2009 - Table Mt. Star Party (TMSP) 2009**, Ellensburg WA  
<http://www.tmspa.com/>

**Jul 24-25 2009 - Lava Hot Springs Star Party 2009**, Lava Hot Springs  
 ID - <http://ifastro.org/web/index.php>

**Jul 24-26 2009 - RCA Trout Lake Star Party Weekend**, Trout Lake, WA  
 - <http://www.rca-oms.org/sp/pix/troutlake.pdf>

**Jul 25 2009 - OAS Hurricane Ridge Star Party**, Hurricane Ridge, WA  
[http://www.olympicastronomicalsociety.com/Documents/2009\\_OAS\\_calendar.pdf](http://www.olympicastronomicalsociety.com/Documents/2009_OAS_calendar.pdf)

## **AUGUST -**

**Aug 11 2009 - OMSI-RCA Perseid Meteor Shower Star Party**, Rooster Rock State Park & Stub Stewart State Park, OR [http://www.rca-oms.org/sp/sp\\_schedule.htm](http://www.rca-oms.org/sp/sp_schedule.htm)

**Aug 15-23 2009 - Mt. Kobau Star Party 2009 (MKSP)**, Mt. Kobau, near Osoyoos BC <http://www.mksp.ca/>

**Aug 19-23 2009 - Oregon Star Party 2009 (OSP)**, Ochocco NF  
<http://www.oregonstarparty.org/>

**Aug 20-22 2009 - SAS Brooks Memorial Park Star Party 2009**, SR 97 near Goldendale <http://www.seattleastro.org/events.shtml>

**Aug 20-22 2009 - 19th Annual 'Weekend Under the Stars' 2009**, Foxpark WY - <http://home.bresnan.net/~curranm/wuts.html>

**Aug 21-23 2009 - Idaho Star Party 2009**, Bruneau Dunes State Park - <http://ifastro.org/web/index.php> (Boise AS) <http://www.boiseastro.org/>

## **SEPTEMBER -**

**Sep 10-12 2009 - White Sands Star Party**, Alamogordo/White Sands, NM <http://www.zianet.com/wssp/>

**Sep 12 2009 - OMSI-RCA Autumnal Equinox Star Party**, Rooster Rock State Park & Stub Stewart State Park, OR [http://www.rca-oms.org/sp/sp\\_schedule.htm](http://www.rca-oms.org/sp/sp_schedule.htm)

**Sep 17-18 2009 - OAS Camp Delany Fall Star Party**, Sun Lakes SP - <http://www.olympicastronomicalsociety.com/Documents/FALLCAMPDELA NYSign-UpForm.pdf>

**Sep 18-19 - Orion Nebula 2009 Star Party**, Table Mt. (Ellensburg) WA  
<http://www.seattleastro.org/orionnebbsp.shtml>

**Sep 17-19 2009 - CalStar2009**, Lake San Antonio Park CA  
<http://www.sjaa.net/calstar/> - <http://www.sjaa.net/>

**Sep 18-19 2009 - Craters of the Moon Star Party 2009**, Craters of the Moon Nat. Monument, ID <http://ifastro.org/web/index.php>  
<http://www.boiseastro.org/>

**Sep 19-20-28 2009 - Alberta Star Party 2009**, Starland Recreation Area Campground near Drumheller, Alberta, CA  
<http://www.astronomycalgary.com/events/info/155>  
<http://calgary.rasc.ca/asp2009.htm>

## **OCTOBER -**

**Oct 14-17 2009 - The Enchanted Skies Star Party 2009**, Socorro NM - <http://enchantedskies.org/>

## **NOVEMBER -**

**Nov 12-15 2009 - Nightfall 2009**, Palm Canyon Resort, Borrego Springs, CA <http://www.rtmcastronomyexpo.org/nightfall.htm>

**Nov 14 2009 - Night Under the Stars 2009**, Alamo Lake, AZ - <http://azstateparks.com/Parks/ALLA/events.html>

## **OTHER -**

(tbd Aug) - **Deception Pass Star Party 2009**, Bowman Bay, Deception Pass, WA - [http://squakmountain.org/deception\\_pass\\_star\\_party.htm](http://squakmountain.org/deception_pass_star_party.htm)  
<http://squakmountain.org/events.html#upcoming>

(tbd Oct) - **All Arizona Star Party** (near Arizona City, AZ) - <http://www.eastvalleyastronomy.org/aasp.htm>

(tbd) - **Blue Mountain Star Party**, Ukiah, OR  
<http://www.stargazing.net/tcac/EventsCalendar.htm>  
<http://www.stargazing.net/tcac/gmBluMtn.htm>

(tbd) - **Montana Starwatch**, Great Falls, MT <http://smasweb.org/>

## **Other Star parties:**

<http://www.cloudynights.com/ubbthreads/showflat.php/Cat/0/Number/2858373/Main/2858366>

## **EAS MEMBER NEWS**

### **The Planetarium -- May - July 2009**

**From OC Space -**

**the Newsletter of Orange County Space Society**

*-By EAS member John W Goerger*

Ghosts exist! As you gaze at the night sky you are seeing celestial objects, the way they were; not in the present, but their past. For some, it is the recent past and others the more distant past; specters-objects without substance! Someday we will have the technology to build an optical telescope that would allow us to see Earth-type planets and the life forms on that world. We would be witnessing beings without substance, much the same as when you are watching a movie or a TV program; an image but no substance.

As you know there are astronomers scanning the stars, with radio telescopes in the hope of picking up either deliberate or unintentional radio transmissions from other intelligent civilizations in the Universe. If signals are ever detected, they are from a techno-society that no longer exists now; at the time of discovery-they would be "Specters", beings without substance-the Ghosts of Space-Time Past. Does your brain hurt now?

If your "brain" is hurting, then the following clarification will help! When observing celestial objects from Earth, you are seeing them the way they were. In astronomy the Speed of Light is the Unit of Measurement, and that measurement is not "Time" but Distance. The term Light Year, is the distance light travels in one Earth-Year, which is approximately 6 Trillion Miles (6,000,000,000,000). Additionally, light does not speed up or slow down in the vacuum of space but remains constant; 186,000 miles in one-second-of-time.

If by chance, Radio Telescopes ever detected radio signals, say from the other side of the Milky Way Galaxy from a technological civilization like ours, their radio signals, would have been transmitted over 400,000 earth years ago; moving at 6 trillion miles/yr times 400,000 earth yrs. (new data indicates our galaxy is twice the size and mass than previously estimated). We would not be able to have a conversation with them; and statically the numbers do not look good for there being others nearby, that we could "pal around with".

As you stargaze at the night sky of July 2009, you might wonder how our star looks visually, at a distance of 50 light years? It would be almost at the absolute magnitude of the unaided human eye (6.0), 5.8. Now, imagine you were 50 Lys from our star right now, and you had a telescope who's diameter would allow you to not just see the Earth, but to witness human events that were occurring; you would observe events of, July 1959! Then, would have to wait another 10 yrs to witness humankind's greatest achievement, the First Manned landing upon the Earth's Moon!

The United States has sent a probe to the moon called LRO/LCROSS (Lunar Reconnaissance Orbiter/Lunar CRater Observation and Sensing Satellite) which is orbiting about that yellow-whitish orb, for at least

one year. In about 4 months, according to NASAfact sheet; “the LCROSS shepherding spacecraft & the Atlas V’s Centaur upper stage will enter a position for LCROSS to impact near a lunar pole. The spacecraft & Centaur will separate, with Centaur becoming the 1<sup>st</sup> impactor creating a plume, followed 4 minutes later by the shepherding spacecraft going through the plume, collecting & relaying data to Earth, before it also impacts onto the moon”. Amateur astronomers with telescopes of at least 10 inches should be able to see the flash & dust of the impact!

Increase your scientific & astronomical library with these texts: ANTIMATTER 2009; ASTRONOMY-A Little Giant Book 2007; MISSION TO THE MOON with DVD 2009 1<sup>st</sup> U.S. Edition; ONE SMALL STEP, A Scrapbook 2009; and THE STARFLIGHT HANDBOOK 1989 (check out a used bookstore for this one). Any questions, email me at [pos1@earthlink.net](mailto:pos1@earthlink.net)

July 3<sup>rd</sup>, Earth is at its farthest distance from the sun (aphelion 94.5 million miles). Saturn’s west at a visual 1.0 until midnight, & as it sets, Jupiter, -2.8, rises in the east with Neptune, 7.8 being 34 arc minutes of Jupiter by the 9<sup>th</sup>. Venus, -4.1 rises 3hrs before the sun & Mars at 1.1. Comet Kopff on the 23<sup>rd</sup> will be at RA: 22hrs 58mins; DEC:-9.48 at visual 8 (need a telescope for this one).

### Other Member News...

**Outreach chairperson:** (currently **vacant**) - Coordinate requests from public for EAS member volunteers to conduct star parties or presentations at visits to schools, senior centers, scout meetings, etc. We often have requests for members of the EAS to come and help with an ‘astronomy night’ event from local schools, scout groups, senior homes, or similar groups. Usually this would be in the form of a star party at their gathering, or perhaps a short slide show or night sky talk. Providing education and support to the community about interest astronomy is one of the main missions of the EAS. Please let club president know if you are interested and available to be on list of volunteers to handle these requests, so that we can say YES when people ask. A star party night can be a rewarding event for all involved. **Please email Mark Folkerts with your interest (or suggestions).**

**Sidewalk astronomy committee:** (currently **vacant**). – Plan and conduct urban/suburban sidewalk astronomy events to allow passers-by to experience astronomy. Needs 2-3 people for each event, and to schedule events. We are looking for volunteers who could do a series of Sidewalk Astronomy sessions this spring and summer, at a local park or public venue. For safety, moral support, and effectiveness, this should be done in teams of at least two people with telescopes. Special events like eclipse or comets especially draw the interest of the public.

**Other volunteers?** Find a way to help and contribute. Come up with a new idea to promote the EAS and astronomy in your community. Come to Astronomy Day or a star party and share your interest in the sky...

## EAS MEMBERSHIP BENEFITS & INFORMATION

### EAS Benefits -

Membership in the Everett Astronomical Society (EAS) includes invitations to all of the club meetings and star parties, and entitles members to the monthly newsletter, *The Stargazer*. Also, a 10% discount is also being offered to EAS members for purchases at Aurora Astro Products in Everett. Only members may vote in EAS elections, or be eligible for EAS drawings.

### Magazine Discounts –

In addition you will be able subscribe to *Sky and Telescope* for \$7 off the normal subscription rate, contact the treasurer (Carol Gore) for more information.

<http://everettastro.org/application.htm> (When renewing your subscription to *Sky & Telescope* you should send your S&T renewal form along with a check made out to Everett Astronomical Society to the EAS address. The EAS treasurer Carol Gore will renew your *Sky and Telescope* subscription for you. Astronomy magazine offers a similar opportunity to club members.)

### Membership in the Astronomical League -

EAS is a member of the **Astronomical League** and you will receive the Astronomical League's quarterly newsletter magazine, *The Reflector*.

### EAS Club Telescope Borrowing -

Being a member also allows you the use of the club's telescopes, including an award winning 10 inch Dobsonian mount reflector, a second 10" dob, or and 8" Dobsonian. Contact Jim Bielaga (425) 337-4384 to borrow a telescope.

### 10% Discount on Purchases at 'Aurora Astro Products' in Everett -

EAS members are currently offered a 10% discount for all purchases of any telescopes, accessories, or other items at Aurora Astro Products, when they show their EAS membership card.

### EAS Library -

Membership will give you access to all the material in the lending library. The library, consists of VCR tapes, DVDs, many books, magazines, and software titles. The EAS has a library of books, videotapes, and software for members to borrow, **located at Aurora Astro Products store**. We always value any items you would like to donate to this library. You can contact a club officer or **Librarian Mike Locke**, phone (425) 259-5995, email lockemi at comcast.net, to borrow or donate any materials, or **contact Jim Bielaga at Aurora Astro**. See library items list here: [http://everettastro.org/eas\\_library.htm](http://everettastro.org/eas_library.htm)

### Joining or Renewing with the EAS -

EAS dues are \$25 / year per family. Funds obtained from membership dues allows the EAS to publish the Stargazer newsletter, pay Astronomical League dues, pay insurance, host a web site, and maintain our library. If it has been a year since you paid your dues, please re-subscribe to keep the club financially solvent, and to continue to receive membership benefits. <http://everettastro.org/application.htm>

**Send your annual dues renewals to the  
Everett Astronomical Society  
P.O. Box 12746, Everett, WA 98206.**

Those who have **subscriptions to Sky and Telescope** can now pay their own subscription as long as they are EAS members in good standing. Members will now be able to renew directly via mail or phone and still obtain the club discount. The subscribers may mail in the renewal notices with their payment, or renew via phone at (800) 253-0245. Payment at the time of renewal is required. Once a year, Sky and Telescope will check with the EAS club treasurer to see that the subscribers are still members in good standing to qualify for the discount. New members will continue to subscribe through the club treasurer.

### Attention EAS Members – 10% Discount for all Everett Astronomical Society Members at Aurora Astro Products

*“Mention your EAS club membership at Jim Bielaga's astronomy store 'Aurora Astro Products' and receive a 10% discount on all purchases. This is an exclusive discount to current E.A.S. members only.*

*I am proud to be able to offer this discount to Everett club members, and thanks for the support you have shown me on opening my new store. Also I have made great friends and learned a lot being a club member since 1991.*

*- Clear Skies, Jim Bielaga”*

**>> Members – please look at your EAS membership card to see when your membership dues are payable. If you are more than three months past due, the club will officially assume that you no longer wish to be a member, and remove you from the membership rolls. <<**



# Aurora Astro

## Aurora Astro Products

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11419 19th Avenue SE #A102

Everett, WA 98208

[www.auroraastro.com](http://www.auroraastro.com)

425-337-4384

425-337-4758 fax

### Hours:

Monday, Thursday, Friday – 9:00 am to 6:00 pm .

Tuesday/Wednesday – Noon to 6:00 pm .

Saturday – 10:00 am to 5:00 pm .

Aug 25 - Northern Iota Aquarids Meteor Shower Peak

## September 2009

Sep 04 - Saturn's Rings Edge-on From Earth

Sep 17 - Uranus At Opposition

**Sep 17-18 OAS Camp Delany Fall Star Party**

**Sep 18-19 Orion Nebula 2009 Star Party**

**Sep 19 – EAS Star Party at Ron Tam's place**

Sep 22 - Autumnal Equinox (21:18 UT)

Sep 26-27 - Pacific Astronomy & Telescope Show - Pasadena Conv. Ctr.

## October 2009

Oct 09 - Draconids Meteor Shower Peak

**Oct 17 – EAS Star Party at Ron Tam's place**

Oct 21 - Orionids Meteor Shower Peak

## November 2009

**Nov 14 – EAS Star Party at Ron Tam's place**

## December 2009

## UW Astronomy Speakers Colloquium Schedule

Astronomy Department weekly colloquium meets Thursdays at 4:00 pm in PAB A102 - the classroom part of the Physics/Astronomy Building complex. <http://www.astro.washington.edu/pages/colloquium.html>

## 'IT'S OVER YOUR HEAD' – ASTRONOMY PODCASTS

Web page with lots of archives and other info is available at <http://www.celestialnorth.org/radio/index.php> and podcasts at <http://www.celestialnorth.org/radio/index.php>

**KPLU 88.5 FM National Public Radio has daily broadcasts of "Star Date"** by the McDonald Observatory of the University of Texas at Austin, Monday through Friday at about 6:05 pm. The short 2 minute radio show deals with current topics of interest in astronomy. The University of Washington TV broadcasts programs from NASA at 12:00 AM Monday through Friday, 12:30 AM Saturday, and 1:30 AM Sunday on the Channel 27 cable station.

## OBSERVER'S INFORMATION...

### LUNAR FACTS

Jul 07	Full Moon
Jul 15	Last Quarter Moon
Jul 22	New Moon
Jul 28	First Quarter Moon
Aug 06	Full Moon
Aug 13	Last Quarter Moon
Aug 20	New Moon
Aug 27	First Quarter Moon
Sep 04	Full Moon
Sep 12	Last Quarter Moon
Sep 18	New Moon
Sep 26	First Quarter Moon

### UP IN THE SKY -- THE PLANETS (AND PLUTO)

Object	Rises	Sets	Con	Diam.	Mag
Sun	05:30 am	21:01	Gem	30'	-27.5
Mercury	05:45 am	21:25	Can	05"	-1.4
Venus	02:38 am	17:57	Tau	16"	-4.1

## \$\$ - FINANCIAL HEALTH - \$\$

The club maintains a \$750+ balance. We try to keep approximately a \$500 balance to allow for contingencies. .

## CLUB SCOPES

SCOPE	LOAN STATUS
13-INCH THIN-MIRROR DOB	FINISHING REHABILITATION
10-INCH WARD DOBSONIAN	AVAILABLE
10-INCH SONOTUBE DOBSONIAN	AVAILABLE
8-INCH DOBSONIAN	AVAILABLE

EAS members: contact VP James Bielaga at (425) 337-4384 or [jamesbielaga@aol.com](mailto:jamesbielaga@aol.com) to borrow a scope.

## ASTRO CALENDAR FOR 2009

### July 2009

Jul 04 - Earth At Aphelion (1.017 AU From Sun)

Jul 07 - Penumbral Lunar Eclipse

Jul 15-19 - Mt Bachelor Star Party (MBSP) 2009

**Jul 18 – EAS Bar-B-Q Meeting and Star Party at Jim Bielaga's place on Camano Island**

**Jul 20-25 - Table Mt. Star Party (TMSP) 2009**

Jul 20 - 40th Anniversary (1969), 1st Man On The Moon (Apollo 11)

Jul 22 - Total Solar Eclipse (China/Pacific)

Jul 29 - South Delta-Aquarids Meteor Shower Peak

### August 2009

Aug 01 - Alpha Capricornids Meteor Shower Peak

Aug 06 - Penumbral Lunar Eclipse

Aug 06 - Southern Iota Aquarids Meteor Shower Peak

Aug 12 - Perseids Meteor Shower Peak

Aug 17 - Neptune At Opposition

**Aug 19-23 Oregon Star Party 2009 (OSP)**

**Aug 22 – EAS Star Party at Ron Tam's place**

Aug 24 - Mercury At Its Greatest Eastern Elongation (27 Degrees)



Mars	01:55 am	17:15	Ari	05"	+1.1
Jupiter	22:16	08:19 am	Cap	48"	-2.8
Saturn	10:13 am	23:16	Leo	17"	+1.1
Uranus	11:09 am	23:19	Psc	04"	+5.8
Neptune	22:14	08:24 am	Cap	02"	+7.8
Pluto	18:49	04:15 am	Sag	--	+13.9

(times listed are in local time for Everett PDT)

### Digital Lunar Orbiter Photographic Atlas of the Moon

The Lunar and Planetary Institute has created a digital version of the Lunar Orbiter Photographic Atlas of the Moon, and Consolidated Lunar Atlas available online at:

<http://www.lpi.usra.edu/research/cla/menu.html>

[http://www.lpi.usra.edu/research/lunar\\_orbiter](http://www.lpi.usra.edu/research/lunar_orbiter)

### Observing Jupiter's Moons – Java tool

<http://skytonight.com/observing/objects/javascript/iupiter>

### Transit times for Jupiter's Great Red Spot in 2008

<http://skytonight.com/observing/objects/planets/3304091.html>

### NOAA SUN CALCULATOR

Need to know exactly what time the sun will set on Sept. 26, 2065? Or when it rose in 565 BC? How about the length of daylight a week from Tuesday in Albuquerque, N.M.? Just go to NOAA's solar calculator, now available on the Web.

<http://www.srrb.noaa.gov/highlights/sunrise/gen.html>

### INTERNATIONAL SPACE STATION – VISIBLE SEATTLE PASSES

ISS Visibility – Heavens Above:

<http://www.heavens-above.com/PassSummary.asp?lat=47.979&lng=-122.201&alt=0&loc=Everett&TZ=PST&satid=25544>

### CONSTELLATION OF THE MONTH – AQUARIUS & TRIANGULUM

**AQUARIUS: (The Water Bearer).** With a midnight culmination date of August 25th, Aquarius is perfectly placed for summer viewing. It contains the asterism of the Water Jar, and borders on the constellations of Aquila, Capricorn, Cetus, Delphinus, Equuleus, Pegasus, Pisces, Piscis Austrinus, and Sculptor. It includes several named stars (such as Alkali and Situla), and ranks 65th in overall brightness among the constellations, and 10th in size, taking up almost 2.5% of the entire sky. It contains six known meteor showers, and three Messier objects (M2, M72, and M73). Aquarius is completely visible from latitudes +65 degrees to -87 degrees, and portions are visible worldwide. It has 56 stars greater than magnitude 5.5, and its central point is at RA=22h15m, and Dec.= -11 degrees. Three very interesting facts about Aquarius need to be stated. First, the planet Neptune was discovered in Aquarius by the German astronomer Galle at the Berlin Observatory in 1846. Secondly, the often-discussed "Age of Aquarius" will occur when the vernal equinox moves from its current position in Pisces into Aquarius. This movement is caused by the earth's precession. However, "worldwide peace and understanding", often equated with this "Age", is about 800 years away (unfortunately!!!). Lastly, the closest planetary nebula to earth, the Helix Nebula, is 700 light years away. This proximity makes it appear so large in optical instruments. It is a beautiful planetary nebula lying close to the neighboring star of Fomalhaut. Enjoy this object in a low power optical instrument (telescope or good binoculars) next time you are at a fairly dark summer sky site. Aquarius is a rewarding summer constellation: take in its treasures this summer if you can.

**DELPHINUS: (The Dolphin or Porpoise).** With a midnight culmination date of July 31<sup>st</sup>, Delphinus (abbreviated Del) is best viewed from August through September, and is thus well placed for summer viewing in the Northern Hemisphere. It contains the asterism known as "Job's Coffin", but has no associated Messier objects or meteor showers. Bordering constellations include Aquarius, Aquila, Equuleus, Pegasus, Sagitta, and Vulpecula. Delphinus ranks 61<sup>st</sup> in overall brightness among the constellations (overall brightness is calculated by dividing the number of visible stars in a constellation by the size of the constellation in square degrees, and then multiplying that number by 100). Delphinus ranks 69<sup>th</sup> in size, taking up only 188.54 square degrees (0.457% of the sky; note: this square degree factor would be the denominator in the above equation: the smaller the denominator the larger the result – in this case, overall brightness). The number of visible stars (stars brighter than magnitude 5.5) in this relatively small constellation is 11.

Delphinus is completely visible from latitudes North of -69 degrees, and completely invisible from latitudes South of -88 degrees. Its central point is at RA=20h39m, Dec.= +11.5 degrees. The solar conjunction date of Delphinus is January 31<sup>st</sup>.

### Some Interesting Facts About Delphinus:

The common names of Alpha Delphinus (Sualocin) and Beta Delphinus (Rotanev) spelt backwards give the names of Nicolaus Venator, the assistant to the astronomer Giuseppe Piazzi. Both the early Greeks and Romans saw the outline of a dolphin in Delphinus. In Greek mythology, Delphinus rescued the poet Arion from sailors who planned to kill him, and brought the poet ashore at Tarentum. In appreciation, Poseidon permanently set the dolphin among the stars. Objects of note in this constellation include Gamma Delphini. This "star" is actually a double star: the primary is magnitude +4.5, and the secondary is fifth magnitude; they are separated by 10.1 arc seconds. NGC 6891 is a magnitude +10.5 planetary: it has a strong bluish tint, and appears very rounded in an eight-inch scope. NGC 6905 is also a planetary nebula, about 40 arc seconds in diameter. If you have the opportunity for summer observing, try to either observe this area of the sky naked eye, or do a gentle binocular sweep of the beautiful areas surrounding the Milky Way, including the constellation of the "Dolphin".

**TRIANGULUM: (The Triangle).** With a midnight culmination date of October 23rd, Triangulum is well-placed for Fall viewing. Triangulum borders on the constellations of Andromeda, Aries, Perseus, and Pisces; there are no established asterisms within its borders. Triangulum ranks 27th in overall brightness among the constellations, but 78th in size: it takes up approximately 131.85 square degrees (0.320%) of the sky. Triangulum contains no known meteor showers, but one Messier object: M-33 (also known as the Northern Pinwheel Galaxy). Triangulum is completely visible from latitudes North of -53 degrees, and completely invisible from latitudes South of -65 degrees. It has 12 stars brighter than magnitude 5.5, and its central point is at RA=2h08m, Dec.= +31 degrees. The solar conjunction date of Triangulum is April 24th. M-33 is a large, face-on spiral galaxy in Triangulum, and is, at a distance of 1.1 megaparsecs, the closest directly face-on spiral galaxy to Earth observers, but is notorious for being difficult to find in backyard telescopes. Its total magnitude is 5.7, but on viewing nights with sub-optimal seeing, backyard scopes will barely even show its nucleus, let alone any spiral structure. The reason for this is that M-33 is a very large, diffuse galaxy, with dimensions of 62 x 39 arc minutes. When this is combined with its direct face-on orientation, the spiral arms of the galaxy offer a surface brightness of only 14.0 magnitudes per square arc-minute. Larger apertures, good seeing and dark skies, and low f/ratios show knotty patches of darker nebulosity, faintly glowing

spiral arms containing scattered brighter patches, a small stellar-like nucleus, and NGC-206, a bright starcloud lying 10 arc-minutes northeast of M-33's core. In very, very dark skies with good seeing, M-33 is visible naked eye: when this occurs, it overtakes the Andromeda Galaxy as the furthest object visible without optical aid. Triangulum contains other galaxies as well: NGC-672 (an 11.6 magnitude barred spiral); NGC-925 (a large but faint Sb-type spiral); and NGC 750-751, a small double galaxy containing two elliptical galaxies: one 13th magnitude and one 13.8 magnitude, separated by only 24 arc seconds. See if you can discover some of the beauties of Triangulum on a clear, moonless night this Fall in the darkness away from city lights.

### YOUNG ASTRONOMER'S CORNER

**Now is the time of year when many amateur astronomers' thoughts turn to observing outdoors with their telescopes, binoculars, etc... This helpful column has been published before in the EAS Newsletter, but bears repeating this great time of year! Here are some helpful hints for observing at outdoor telescope "STAR" PARTIES this season: enjoy the night sky warmly and safely!**

★★ Dress warmly, or at least be prepared to do so. If the evening starts out warm, it may not end up that way!

★★ The warmest clothes include polypropylene worn directly against the skin; other warm clothes include those made of wool. Layered cotton clothing can also keep you warm, but you will tend to need more layering. Additionally, if cotton materials get wet, they do not transport moisture away from the body (like polypropylene and wool), but are rather more likely to chill you.

★★ Most body heat is radiated from the head, so make sure you have a good hat that also covers the ears. Good gloves are important as well. Polypropylene glove liners make excellent astronomy gloves because they are not bulky: it is thus easier to use equipment and read charts, etc....

★★ An excellent all-purpose piece of clothing for use in observing is a hooded-sweatshirt. A hooded sweatshirt can cut down on chilling winds entering down your neck: it essentially serves two purposes: it cuts down on the aforementioned wind effects, and it serves to contain body heat radiating from the head.

★★ Always wear warm socks. Socks that wick moisture away from the skin (such as wool or polypropylene) are excellent. Extra pairs for layering can come in handy too.

★★ A good windbreaker jacket (with an integral hood) is an excellent way to conserve body heat and minimize chill, and can be the outermost clothing in any necessary layering.

★★ Eat well and drink plenty of fluids to avoid dehydration. Good nutrition (including carrots which can improve night vision as a source of Vitamin A) and hydration can help to maintain alertness, body warmth, and help to battle fatigue. Most areas allow camp stoves, but open fires are prohibited. Alcohol and nicotine can interfere with the conservation of body heat. Also – and importantly – tobacco use can be very annoying to your fellow astronomers, as the majority are non-smokers. Further, some people have medical conditions which can be aggravated by cigarette smoke. If you must smoke, please smoke far enough away from people and delicate optical instruments which can pick up smoke film residues. So always be courteous to your fellow astronomers - and good to your own body - by not smoking!

★★ Always follow established STAR PARTY etiquette (which is usually published): red flashlights only at night, and extra batteries can be

helpful. If you must listen to music, bring headsets, as your taste in music may be different than your neighbors. Follow STAR PARTY rules about pets: most allow them, but they must be leashed. ALWAYS ask another astronomer if it is OK to look through their scope before you do: some may be taking pictures, or they may not want to be disturbed at that particular time. Many if not most astronomers are very friendly and helpful – and love to have people look through their scopes – but be sure to ask first!

★★ STAR PARTIES are frequently held in remote areas. Always let someone know where you are and what your expected time of return will be: this is especially true if you go off on your own. In that respect, it is ALWAYS better to go in two's with a friend or fellow astronomer. If you have any allergies or other medical conditions, be sure to take your allergy and/or other medicines (including bee sting antidote and heart and asthma medicines, for example) with you: you will generally be at least an hour away from medical attention.

★★ You can enjoy a STAR PARTY without a telescope. *IT IS NOT NECESSARY TO SPEND LOTS OF MONEY TO ENJOY THE NIGHT SKY.* A lawn chair and a blanket, perhaps with a pair of binoculars and a basic night sky book or map of your choice, can result in countless hours of enjoyment and learning about astronomy without spending a lot of money or time in preparation. Going to an official STAR PARTY is a great way to learn and meet new people with varying levels of astronomy knowledge. NEVER be intimidated because you think someone may know more about the subject than you do: everybody starts somewhere!!!... and most astronomers love to answer questions about the night sky and astronomy equipment!!

★★ Finally, respect for your fellow astronomers by following the simple rules above, and respect for the environment while you are there (never leave trash; stay away from fragile areas of grass and wilderness), will also make your star party experience much more enjoyable. See you at an upcoming STAR PARTY!!

### PLANETARY FOCUS -

**This month, our guest planet is Mercury, and these are the facts:**

**Rotation around the Sun:** 88 days (earth = 365 days).

**Orbit:** from 0.31 to 0.47 astronomical units (AU); this is about 29-44 million miles from closest to furthest points away from the Sun. This is a very eccentric (non-circular) orbit.

**Inclination of orbit:** 7 degrees.

**Diameter at equator:** 3,048 miles.

**Mass:** one-sixteenth that of earth.

**Density:** 5.4 times that of water.

**Period of rotation on its own axis:** 58 days, 15 hours, 30.5 minutes (earth=24 hours).

**Satellites (moons):** None

**Gravity:** about one-third that of earth's.

**Special Notes:** Mercury is one of two (the other is Venus) planets closer to the Sun than the earth. It is never more than 28 degrees from the Sun, which makes it always so difficult to observe. It has a temperature range of between +450 degrees C. (when it's close to the sun) , to -180 degrees C. at night. It has an almost imperceptible atmosphere, which contains very small levels of helium, oxygen, and argon, as well as some sodium and potassium. It resembles our own moon in that it is heavily cratered. Mariner 10, a U.S. probe, made close approaches to the planet in 1974 and 1975. Mercury is a rocky planet (terrestrial planet), with a probable nickel-iron core, and a silicate-rich crust.

## ASTRONOMY AND TELESCOPE “LINGO”

**Astronomy “Lingo”:** **PECULIAR STARS:** Stars with spectral characteristics that do not exactly correspond with the usual classification of spectral types. They are generally designated with a ‘p’ after their spectral type (e.g., ‘Ap’ stars); however, specific features are also given individual designators (such as ‘e’ for emission or ‘m’ for metallic).

**Astronomy lingo:** **FREE-FALL TIME:** The time it would take for a system to collapse in upon itself under the force of gravity, if it were not supported by either its own internal pressure or system rotation.

**Telescope lingo:** **BASELINE:** The straight line between two observational points; for example, the line between the elements of an interferometer. The longer the baseline between two radio telescopes, for instance, the finer the detail that can be resolved in a radio source.

**Telescope “Lingo”:** **MONOCHROMATOR:** An instrument in which one narrow band of wavelengths is separated and isolated from a light beam, or other radiation. This isolation is usually achieved by using a narrow-band interference filter, or via a diffraction grating or prism, used together with an exit slit through which the desired waveband passes. Intensity changes in the monochromatic beam can then be studied.

## ASTRONOMY “FUN FACTS”

The following are some Astronomy “Fun Facts” about our nearby “sister” planet Venus:

★ ★ **On Venus, sunrise is in the west, and sunset in the east (opposite to that of Earth).** That is, Venus rotates east to west (unlike the other 8 planets (the other odd rotator is Uranus, which is lying on its side(!) compared to the other planets)). This is called retrograde rotation. The rotation of Venus is thus unique in 2 ways: it is extremely slow (it rotates about once every 8 months; Earth rotates once per 24 hours), and it has retrograde rotation compared to the other planets.

★ ★ **Venus, at its closest to Earth, is still about 106 times further away from Earth than is the Moon.** At the average speed of an Apollo mission, it would still take a one-way manned mission about 1.5 years to reach the planet .

★ ★ **Even with a manned mission however, Venus would be a very inhospitable place indeed.** The surface temperature of Venus is about 470 degrees Celsius, enough to make lead molten, and more than enough to make steel red hot; the surface temperature of Venus is essentially controlled by a runaway greenhouse effect. The three distinct cloud layers (with very high upper level winds) of Venus are all composed of sulfur and sulfuric acid, and the atmosphere itself is composed of about 96% carbon dioxide. The atmospheric pressure on the surface of Venus is about 90 times that of Earth’s surface (about 1,320 pounds per square inch); additionally, Russian and American space probes have detected far, far more lightning strokes per unit area than is found on Earth. Indeed, Venus appears to be the type of other world best left to the research done by mechanical probes!

## “MIRROR IMAGES”

**“MIRROR” IMAGES”:** Because we live in the Northern Hemisphere, we often tend to focus (in both observing and reading) on celestial objects in this hemisphere. The point of this column is to inform club members about similar objects in the Southern Hemisphere (to the ones we are already familiar with in the Northern Hemisphere). The general class of object will first be defined, and then a representative object from each hemisphere will be described. Note: “MIRROR” IMAGES” is strictly the

name of the new column, and is not intended to imply that there is optical mirror symmetry between the two objects.

**Class of Object:** **DARK NEBULAE:** A cloud of interstellar gas and dust, sufficiently dense to either partially or completely obscure the light from stars and other brighter deep space objects lying behind it, and large enough and strategically located to be noticeable. Dark nebulae can be observed as dark projections in front of bright emission or reflection nebulae, or as empty (i.e., of stars) or relatively empty regions in an otherwise bright area of sky. In spiral galaxies outside the Milky Way, they often are seen against the bright spiral arms, where they appear as darker dust lanes. Although the light absorption in dark nebulae is caused by cosmic dust, dark nebulae are composed primarily of molecular hydrogen. Small dark nebulae, known as Bok granules, can at times be seen in large numbers superimposed on brighter nebulae. In our own Milky Way Galaxy, the dark clouds in Taurus are the closest areas of star formation to our Sun. Even though dark nebulae are devoid of bright optical features, they can be investigated through their radio and infrared emissions.

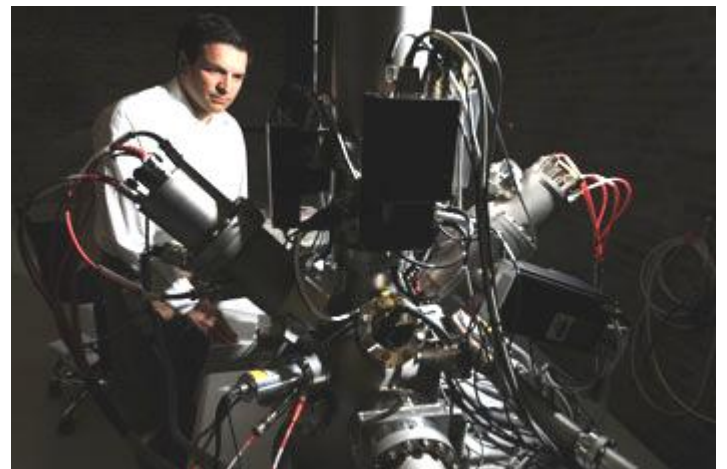
**Representative Northern Hemisphere Object:** **GREAT RIFT:** This feature actually straddles both hemispheres, and is well known to northern hemisphere astronomers who have observed the section of this dark nebula bisecting the Northern Cross (Cygnus). It is a chain-like complex of dark nebulae that relatively obscures the light from a narrow but expansive band of the Milky Way between Cygnus and Sagittarius.

**Representative Southern Hemisphere Object: (Southern) COALSACK:** In the constellation of Crux, this beautiful dark nebula lies about 170 parsecs away. It has an angular diameter of six degrees, and can be seen against the backdrop Milky Way with the naked eye on the eastern side of the Southern Cross.

## ASTRONOMICAL NOTES -- ON & OFF THE WEB...

### METEORITE GRAINS DIVULGE EARTH'S COSMIC ROOTS

The interstellar stuff that became incorporated into the planets and life on Earth has younger cosmic roots than theories predict, according to postdoctoral scholar Philipp Heck and his international team of colleagues. Heck and his colleagues examined 22 interstellar grains from the Murchison meteorite for their analysis. Dying sun-like stars flung the Murchison grains into space more than 4.5 billion years ago, before the birth of the solar system. Scientists know the grains formed outside the solar system because of their exotic composition.



*Philipp Heck with the Chicago Center for Cosmochemistry's time-of-flight mass spectrometer, which can reveal the chemical composition of minute*

experimental samples. Heck and his associates used magnetic sector mass spectrometers in their latest study on interstellar dust grains. (Dan Dry)

"The concentration of neon, produced during cosmic-ray irradiation, allows us to determine the time a grain has spent in interstellar space," Heck said. His team determined that 17 of the grains spent somewhere between three million and 200 million years in interstellar space, far less than the theoretical estimates of approximately 500 million years. Only three grains met interstellar duration expectations (two grains yielded no reliable age).

"The knowledge of this lifetime is essential for an improved understanding of interstellar processes, and to better constrain the timing of formation processes of the solar system," Heck said. A period of intense star formation that preceded the sun's birth may have produced large quantities of dust, thus accounting for the timing discrepancy, according to the research team. [http://news.uchicago.edu/news.php?asset\\_id=1633](http://news.uchicago.edu/news.php?asset_id=1633)

### SALT FINDING FROM CASSINI HINTS AT OCEAN IN ENCELADUS

For the first time, scientists working on the Cassini mission have detected sodium salts in ice grains of Saturn's outermost ring. Detecting salty ice indicates that Saturn's moon Enceladus, which primarily replenishes the ring with material from discharging jets, could harbor a reservoir of liquid water -- perhaps an ocean -- beneath its surface. Cassini discovered the water-ice jets in 2005 on Enceladus. These jets expel tiny ice grains and vapor, some of which escape the moon's gravity and form Saturn's outermost ring. Cassini's cosmic dust analyzer has examined the composition of those grains and found salt within them.

"We believe that the salty minerals deep inside Enceladus washed out from rock at the bottom of a liquid layer," said Frank Postberg, Cassini scientist for the cosmic dust analyzer. Postberg is lead author of a study of the Cassini results.

Scientists on Cassini's cosmic dust detector team conclude that liquid water must be present because it is the only way to dissolve the significant amounts of minerals that would account for the levels of salt detected. The process of sublimation, the mechanism by which vapor is released directly from solid ice in the crust, cannot account for the presence of salt.

"Potential plume sources on Enceladus are an active area of research with evidence continuing to converge on a possible salt water ocean," said Linda Spilker, Cassini deputy project scientist. "Our next opportunity to gather data on Enceladus will come during two flybys in November."

The makeup of the outermost ring grains, determined when thousands of high-speed particle hits were registered by Cassini, provides indirect information about the composition of the plume material and what is inside Enceladus. The outermost ring particles are almost pure water ice, but nearly every time the dust analyzer has checked for the composition, it has found at least some sodium within the particles.

"Our measurements imply that besides table salt, the grains also contain carbonates like soda. Both components are in concentrations that match the predicted composition of an Enceladus ocean," Postberg said. "The carbonates also provide a slightly alkaline pH value. If the liquid source is an ocean, it could provide a suitable environment on Enceladus for the formation of life precursors when coupled with the heat measured near the moon's south pole and the organic compounds found within the plumes."

However, in another study published in Nature, researchers doing ground-based observations did not see sodium, an important salt component. That team notes that the amount of sodium being expelled from Enceladus is actually less than observed around many other planetary bodies. These scientists were looking for sodium in the plume vapor and could not see it in the expelled ice grains. They argue that if the plume vapor does come from ocean water the evaporation must happen slowly deep underground rather than as a violent geyser erupting into space.

"Finding salt in the plume gives evidence for liquid water below the surface," said Sascha Kempf, also a Cassini scientist for the cosmic dust analyzer. "The lack of detection of sodium vapor in the plume gives hints about what the water reservoir might look like."

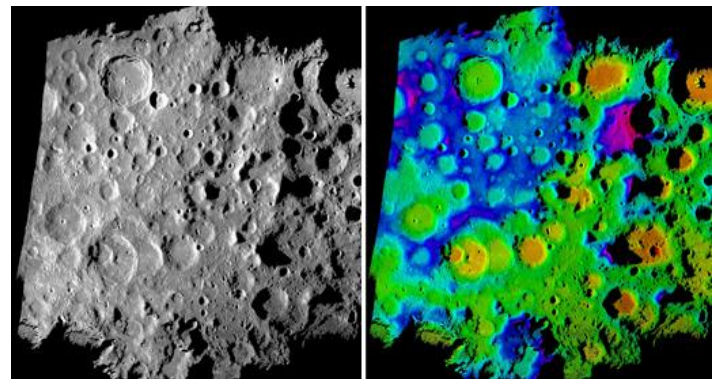
Determining the nature and origin of the plume material is a top priority for Cassini during its extended tour, called the Cassini Equinox Mission.

"The original picture of the plumes as violently erupting Yellowstone-like geysers is changing," said Postberg. "They seem more like steady jets of vapor and ice fed by a large water reservoir. However, we cannot decide yet if the water is currently 'trapped' within huge pockets in Enceladus' thick ice crust or still connected to a large ocean in contact with the rocky core." <http://www.nasa.gov/cassini>

### BRINGING LIGHT TO MOON'S PERMANENTLY DARK CRATERS

A new lunar topography map with the highest resolution of the moon's rugged south polar region provides new information on some of our natural satellite's darkest inhabitants - permanently shadowed craters. The map was created by scientists who collected the data using the Deep Space Network's Goldstone Solar System Radar located in the Mojave Desert. The map will help Lunar Crater Observation and Sensing Satellite (LCROSS) mission planners as they target for an encounter with a permanently dark crater near the lunar South Pole.

"Since the beginning of time, these lunar craters have been invisible to humanity," said Barbara Wilson, a scientist and manager of the study. "Now we can see detailed topography inside these craters down to 40 meters [132 feet] per pixel, with height accuracy of better than 5 meters [16 feet]."



The terrain map of the moon's south pole is online at: <http://www.nasa.gov/topics/moonmars/features/moon-20090618.html>  
<http://www.jpl.nasa.gov/news/news.cfm?release=2009-099>

Scientists targeted the moon's south polar region using Goldstone's 70-meter (230-foot) radar dish. The antenna, three-quarters the size of a football field, sent a 500-kilowatt-strong, 90-minute-long radar stream 373,046 kilometers (231,800 miles) to the moon. Signals were reflected back from the rough-hewn lunar terrain and detected by two of Goldstone's 34-meter (112-foot) antennas on Earth. The roundtrip



time, from the antenna to the moon and back, was about two-and-a-half seconds.

The scientists compared their data with laser altimeter data recently released by the Japanese Aerospace Exploration Agency's Kaguya mission to position and orient the radar images and maps. The new map provides contiguous topographic detail over a region approximately 500 kilometers (311 miles) by 400 kilometers (249 miles).

### SPACE STATION ROOM WITH A SPECTACULAR VIEW

The crew of the International Space Station (ISS) is about to get a new "eye-pod." The Tranquility node headed for the space station early in 2010 will feature a viewing dome unlike any other window ever flown in space. The dome, called the Cupola, is literally studded with windows for observing Earth, space, and the marvelous expanse of the ISS itself.

The Cupola, named after the raised observation deck on a railroad caboose, is designed as an observation platform for operations outside the station--e.g., robotics, spacewalks, and docking spacecraft. Computer workstations inside the dome will give astronauts full control over the space station's robotic arm and dexterous manipulator, while the windows offer unparalleled views of these devices in action.

It's also a place where astronauts can unwind. *"Crews tell us that Earth gazing is important to them,"* says Julie Robinson, ISS Program Scientist. *"The astronauts work hard up there and are away from their families for a long time. Observing the Earth and the stars helps relax and inspire them."*

Until now, space station astronauts have been confined to looking out small portholes or at best the 20-inch window in the US Destiny Laboratory. The Cupola will dramatically expand their view. *"The Cupola's 80-cm diameter circular top window is the largest window ever built for space,"* says Robinson. *"Rather than peering through a little porthole, the Cupola will allow a stunning look at the cosmos and unprecedented panoramic views of Earth. Astronauts will share these views with the world through photographs taken through the windows and posted online."* This could lead to scientific discoveries:



Above: An artist's concept of the Cupola. Credit: NASA

*"By photographing oblique views with different sun angles, the astronauts can use the Cupola to give scientists a view of the Earth that is not available from satellites,"* she adds. Astronaut photographs of Earth have been used to understand Earth processes such as melting of

icebergs, noctilucent clouds, dust storms, and the structure of hurricane eyes.

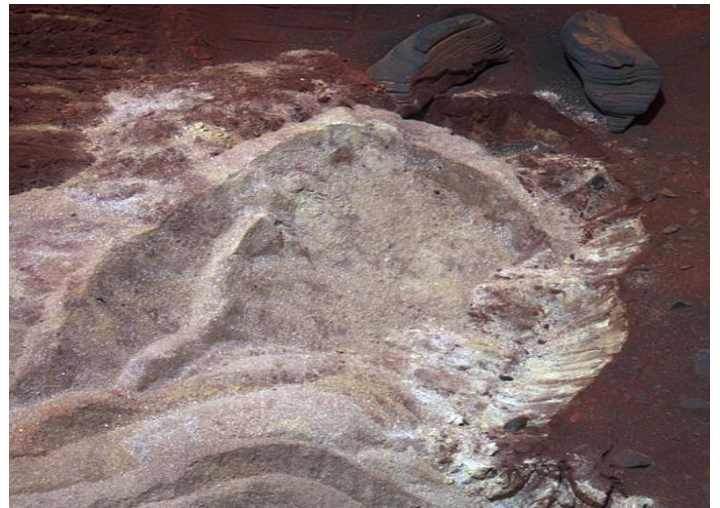
It seems fitting that the space station is getting the Cupola around the time of the 40th anniversary of the Apollo program. Apollo astronauts, like the space station crew, cherished the experience of gazing back at the planet they left behind. Apollo 14 moonwalker Ed Mitchell had this to say: *"Suddenly, from behind the rim of the moon, in long, slow-motion moments of immense majesty, there emerges a sparkling blue and white jewel, a light, delicate sky-blue sphere laced with slowly swirling veils of white, rising gradually like a small pearl in a thick sea of black mystery. It takes more than a moment to fully realize this is Earth . . . home."* From the Cupola, it's going to look better than ever.

The Cupola is now at Kennedy Space Center waiting for final integration on the Node-3 (Tranquility) axial hatch and closeout for flight. With the launch date set for February 2010 on Space Shuttle Endeavour, Node-3/Cupola should be integrated in the Shuttle cargo bay by the end of 2009.

### ROVER YIELDING CLUES WHILE LODGED IN MARTIAN SOIL

Mars rover Spirit, lodged in Martian soil that is causing traction trouble, is taking advantage of the situation by learning more about the Red Planet's environmental history.

In April, Spirit entered an area composed of three or more layers of soil with differing pastel hues hiding beneath a darker sand blanket. Scientists dubbed the site "Troy." Spirit's rotating wheels dug themselves more than hub deep at the site. The rover team has spent weeks studying Spirit's situation and preparing a simulation of this Martian driving dilemma to test escape maneuvers using an engineering test rover at the Jet Propulsion Laboratory.



*The soft soil exposed when wheels of NASA's Mars Exploration Rover Spirit dug into a patch of ground dubbed "Troy" exhibit variations in hue visible in this image, in which the colors have been stretched to emphasize the differences. Spirit used its panoramic camera during the 1,892nd Martian day, or sol, of the rover's mission on Mars (April 29, 2009) to take the three images combined into this composite image. The three images were taken through filters centered at wavelengths of 750 nanometers, 530 nanometers and 430 nanometers. Spirit had become embedded at Troy by about a week later. The two rocks near the upper right corner of this view are each about 10 centimeters (4 inches) long and 2 to 3 centimeters (1 inch) wide. Image Credit: NASA/JPL-Caltech/Cornell University*

A rock seen beneath Spirit in images from the camera on the end of the rover's arm may be touching Spirit's belly. Scientists believe it appears to be a loose rock not bearing the rover's weight. While Spirit awaits

extraction instructions, the rover is keeping busy examining Troy, which is next to a low plateau called Home Plate, approximately 3.2 kilometers (2 miles) southeast of where Spirit landed in January 2004.

"By serendipity, Troy is one of the most interesting places Spirit has been," said Ray Arvidson, deputy principal investigator for the science payloads on Spirit and its twin rover, Opportunity. "We are able here to study each layer, each different color of the interesting soils exposed by the wheels."

One of the rover's wheels tore into the site, exposing colored sandy materials and a miniature cliff of cemented sands. Some disturbed material cascaded down, evidence of the looseness that will be a challenge for getting Spirit out. But at the edge of the disturbed patch, the soil is cohesive enough to hold its shape as a steep cross-section. Spirit has been using tools on its robotic arm to examine tan, yellow, white and dark-red sandy soil at Troy. Stretched-color images from the panoramic camera show the tints best.

"The layers have basaltic sand, sulfate-rich sand and areas with the addition of silica-rich materials, possibly sorted by wind and cemented by the action of thin films of water. We're still at a stage of multiple working hypotheses," said Arvidson. "This may be evidence of much more recent processes than the formation of Home Plate...or is Home Plate being slowly stripped back by wind, and we happened to stir up a deposit from billions of years ago before the wind got to it?"

Team members feel initial readings suggest that iron is mostly present in an oxidized form as ferric sulfate and that some of the differences in tints at Troy observed by the panoramic camera may come from differences in the hydration states of iron sulfates.

While extraction plans for the rover are developed and tested during the coming weeks, the team plans to have Spirit further analyze the soil from different depths. This research benefits from having time and power. In April and May, winds blew away most of the dust that had accumulated on Spirit's solar panels.

"The exceptional amount of power available from cleaning of Spirit's solar arrays by the wind enables full use of all of the rover's science instruments," said Richard Moddis of the team. "If your rover is going to get bogged down, it's nice to have it be at a location so scientifically interesting."

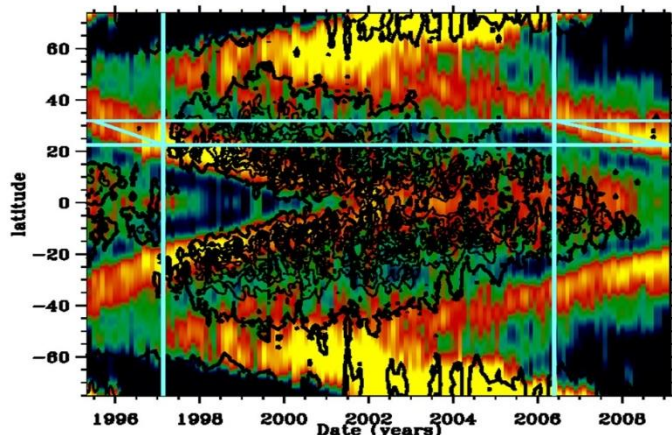
The rover team has developed a soil mix for testing purposes that has physical properties similar to those of the soil under Spirit at Troy. This soil recipe combines diatomaceous earth, powdered clay and play sand. A crew is shaping a few tons of that mix this week into contours matching Troy's. The test rover will be commanded through various combinations of maneuvers during the next few weeks to validate the safest way to proceed on Mars.

Spirit's right-front wheel has been immobile for more than three years, magnifying the challenge. While acknowledging a possibility that Spirit might not be able to leave Troy, the rover team remains optimistic. Diagnostic tests on Spirit in early June provided encouragement that the left-middle wheel remains useable despite an earlier stall.

"With the improved power situation, we have the time to explore all the possibilities to get Spirit out," said John Callas, project manager for Spirit and Opportunity. "We are optimistic. The last time Spirit spun its wheels, it was still making progress. The ground testing will help us avoid doing things that could make Spirit's situation worse." <http://marsrovers.jpl.nasa.gov> and <http://www.nasa.gov/rovers>

## MYSTERY OF THE MISSING SUNSPOTS, SOLVED?

The sun is in the pits of a century-class solar minimum, and sunspots have been puzzlingly scarce for more than two years. Now, for the first time, solar physicists might understand why. Researchers announced that a jet stream deep inside the sun is migrating slower than usual through the star's interior, giving rise to the current lack of sunspots. Rachel Howe and Frank Hill used a technique called helioseismology to detect and track the jet stream down to depths of 7,000 km below the surface of the sun. The sun generates new jet streams near its poles every 11 years, they explained to a room full of reporters and fellow scientists. The streams migrate slowly from the poles to the equator and when a jet stream reaches the critical latitude of 22 degrees, new-cycle sunspots begin to appear.



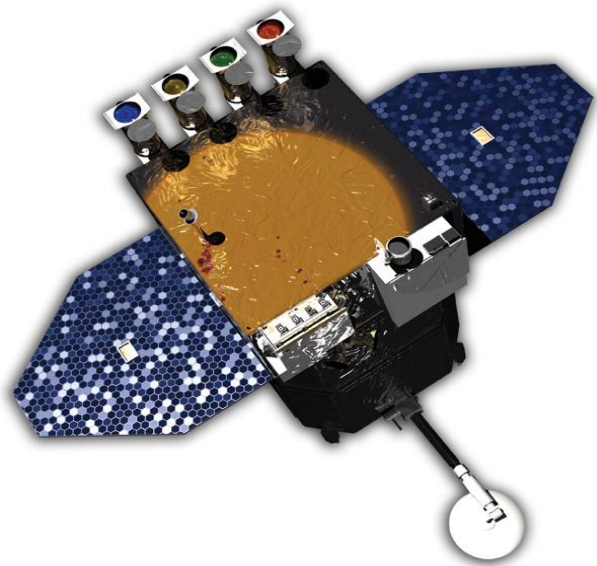
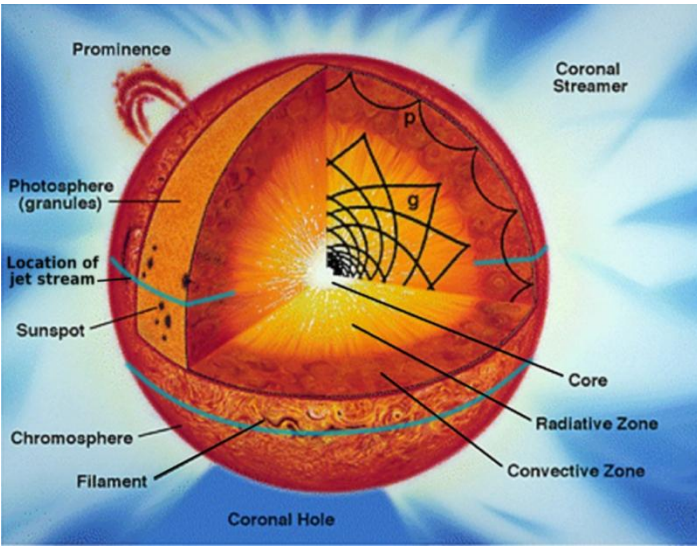
Above: A helioseismic map of the solar interior. Tilted red-yellow bands trace solar jet streams. Black contours denote sunspot activity. When the jet streams reach a critical latitude around 22 degrees, sunspot activity intensifies.

Howe and Hill found that the stream associated with the next solar cycle has moved sluggishly, taking three years to cover a 10 degree range in latitude compared to only two years for the previous solar cycle. The jet stream is now, finally, reaching the critical latitude, heralding a return of solar activity in the months and years ahead. "It is exciting to see", says Hill, "that just as this sluggish stream reaches the usual active latitude of 22 degrees, a year late, we finally begin to see new groups of sunspots emerging."

The current solar minimum has been so long and deep, it prompted some scientists to speculate that the sun might enter a long period with no sunspot activity at all, akin to the Maunder Minimum of the 17th century. This new result dispels those concerns. The sun's internal magnetic dynamo is still operating, and the sunspot cycle is not "broken."

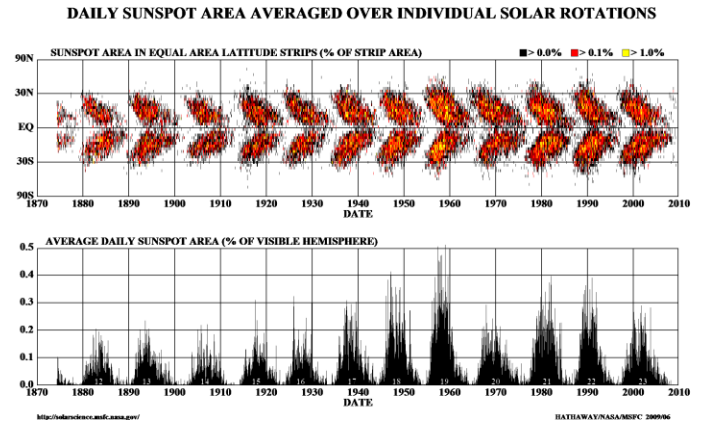
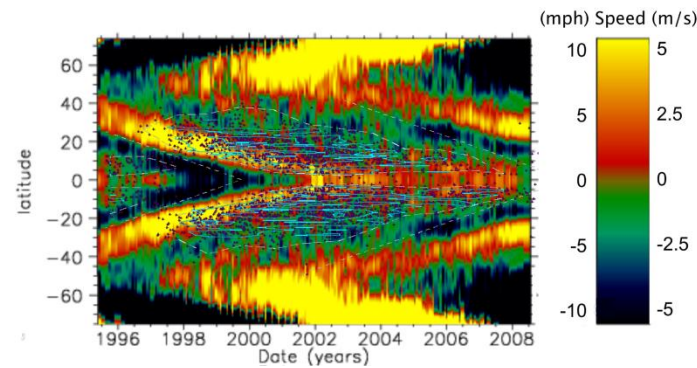
Because it flows beneath the surface of the sun, the jet stream is not directly visible. Hill and Howe tracked its hidden motions via helioseismology. Shifting masses inside the sun send pressure waves rippling through the stellar interior. So-called "p modes" (p for pressure) bounce around the interior and cause the sun to ring like an enormous bell. By studying the vibrations of the sun's surface, it is possible to figure out what is happening inside. Similar techniques are used by geologists to map the interior of our planet.





An artist's concept of the Solar Dynamics Observatory. [more]

Continued tracking and study of solar jet streams could help researchers do something unprecedented--accurately predict the unfolding of future solar cycles. Stay tuned for that!



This diagram shows east-to-west motion like (2) above, but overlain on the surface pattern of sunspots and solar activity high above. The dashed diagonal lines show the slope (in degrees of latitude per year) of the Cycle 23 motion. The Cycle 24 motion has a shallower slope, requiring one extra year compared to Cycle 23 to reach the critical latitude of 22 degrees. The Cycle 24 stream is just now reaching the critical latitude, and faint signs of sunspot activity can be seen in the northern hemisphere at right. This heralds the start of a new solar cycle.

"This is an important discovery," says Dean Pesnell. "It shows how flows inside the sun are tied to the creation of sunspots and how jet streams can affect the timing of the solar cycle." There is, however, much more to learn. "We still don't understand exactly how jet streams trigger sunspot production," says Pesnell. "Nor do we fully understand how the jet streams themselves are generated." To solve these mysteries, and others, NASA plans to launch the Solar Dynamics Observatory (SDO) later this year. SDO is equipped with sophisticated helioseismology sensors that will allow it to probe the solar interior better than ever before.

"The Helioseismic and Magnetic Imager (HMI) on SDO will improve our understanding of these jet streams and other internal flows by providing full disk images at ever-increasing depths in the sun," says Pesnell.

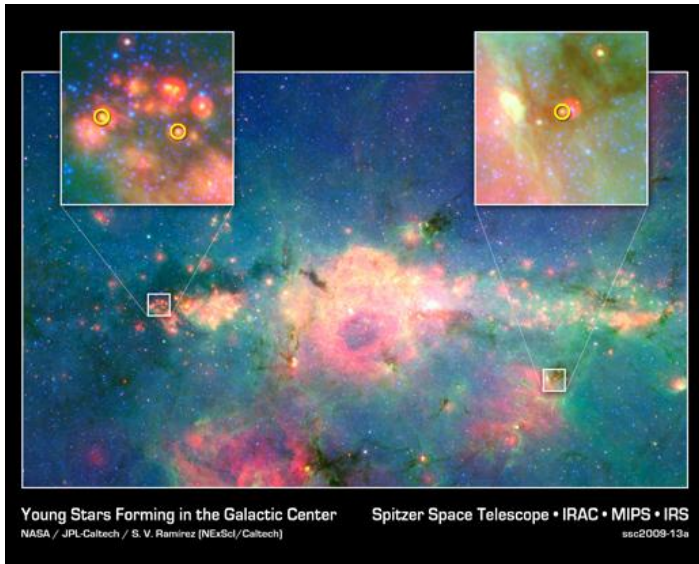
**BABY STARS FINALLY FOUND IN JUMBLED GALACTIC CENTER**

Astronomers have at last uncovered newborn stars at the frenzied center of our Milky Way galaxy. The discovery was made using the infrared vision of the Spitzer Space Telescope.

The heart of our spiral galaxy is cluttered with stars, dust and gas, and at its very center, a supermassive black hole. Conditions there are harsh, with fierce stellar winds, powerful shock waves and other factors that make it difficult for stars to form. Astronomers have known that stars can form in this chaotic place, but they're baffled as to how this occurs. Confounding the problem is all the dust standing between us and the center of our galaxy. Until now, nobody had been able to definitively locate any baby stars.

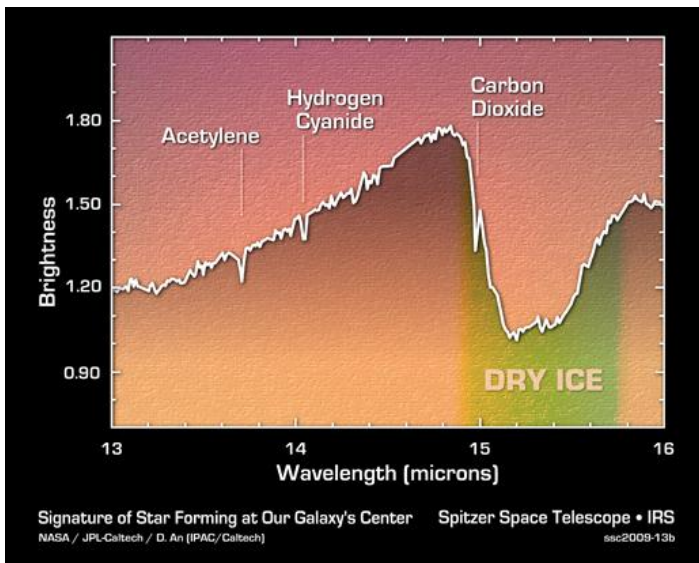
"These stars are like needles in a haystack," said Solange Ramirez, the principal investigator of the research program at the Exoplanet Science Institute. "There's no way to find them using optical light, because dust gets in the way. We needed Spitzer's infrared instruments to cut through the dust and narrow in on the objects."

The team plans to look for additional baby stars in the future, and ultimately to piece together what types of conditions allow stars to form in such an inhospitable environment as our galaxy's core.



This infrared image from NASA's Spitzer Space Telescope shows three baby stars in the bustling center of our Milky Way galaxy. Image credit: NASA/JPL-Caltech

"By studying individual stars in the galactic center, we can better understand how stars are formed in different interstellar environments," said Deokkeun An, lead author of a paper on the results. "The Milky Way galaxy is just one of more than hundreds of billions of galaxies in the visible universe. However, our galaxy is so special because we can take a closer look at its individual stellar components." An started working on this program while a graduate student, under the leadership of astronomer Kris Sellgren, the co-investigator on the project.



These data from NASA's Spitzer Space Telescope reveal a newborn star at the center of our Milky Way. Image credit: NASA/JPL-Caltech

The core of the Milky Way is a mysterious place about 600 light-years across (light would take 600 years to travel from one end to the other). While this is just a fraction of the size of the entire Milky Way, which is about 100,000 light-years across, the core is stuffed with 10 percent of all the gas in the galaxy -- and loads and loads of stars. Before now, there were only a few clues that stars can form in the galaxy's core.

Astronomers had found clusters of massive adolescent stars, in addition to clouds of charged gas -- a sign that new stars are beginning to ignite and ionize surrounding gas. Past attempts had been unsuccessful in finding newborn stars, or as astronomers call them, young stellar objects.

Ramirez and colleagues began their search by scanning large Spitzer mosaics of our galactic center. They narrowed in on more than 100 candidates, but needed more detailed data to confirm the stars' identities. Young stellar objects, when viewed from far away, can look a lot like much older stars. Both types of stars are very dusty, and the dust lying between us and them obscures the view even further.

To sort through the confusion, the astronomers looked at their candidate stars with Spitzer's spectrograph -- an instrument that breaks light apart to reveal its rainbow-like array of infrared colors. Molecules around stars leave imprints in their light, which the spectrograph can detect.

The results revealed three stars with clear signs of youth, for example, certain warm, dense gases. These youthful features are found in other places in the galaxy where stars are being formed.

"It is amazing to me that we have found these stars," said Ramirez. "The galactic center is a very interesting place. It has young stars, old stars, black holes, everything. We started mining a catalog of about 1 million sources and managed to find three young stars -- stars that will help reveal the secrets at the core of the Milky Way."

The young stellar objects are all less than about 1 million years old. They are embedded in cocoons of gas and dust, which will eventually flatten to disks that, according to theory, later lump together to form planets. <http://www.spitzer.caltech.edu/spitzer> and <http://www.nasa.gov/spitzer>

### MYSTERY SOLVED: SPACE SHUTTLE SHOWS 1908 TUNGUSKA EXPLOSION WAS CAUSED BY A COMET

The mysterious 1908 Tunguska explosion that leveled 830 square miles of Siberian forest was almost certainly caused by a comet entering Earth's atmosphere, says new research. The conclusion is supported by an unlikely source: the exhaust plume from the space shuttle launched a century later.

The research connects the two events by what followed each about a day later: brilliant, night-visible clouds, or noctilucent clouds, that are made up of ice particles and only form at very high altitudes and in extremely cold temperatures.

"It's almost like putting together a 100-year-old murder mystery," said Michael Kelley, who led the research team. "The evidence is pretty strong that the Earth was hit by a comet in 1908." Previous speculation had ranged from comets to meteors to black holes.

The researchers contend that the massive amount of water vapor spewed into the atmosphere by the comet's icy nucleus was caught up in swirling eddies with tremendous energy by a process called two-dimensional turbulence, which explains why the noctilucent clouds formed a day later many thousands of miles away. Noctilucent clouds are the Earth's highest clouds, forming naturally in the mesosphere at about 55 miles over the polar regions during the summer months when the mesosphere is around minus 180 degrees Fahrenheit (minus 117 degrees Celsius). The space shuttle exhaust plume, the researchers say, resembled the water vapor from the comet. A single space shuttle flight injects 300 metric tons of water vapor into the Earth's thermosphere, and the water particles have been found to travel to the Arctic and Antarctic regions, where they form the clouds after settling



into the mesosphere. The thermosphere is the layer of the atmosphere above the mesosphere. Kelley and collaborators saw the noctilucent cloud phenomenon days after the space shuttle Endeavour (STS-118) launched on Aug. 8, 2007. Similar cloud formations had been observed following launches in 1997 and 2003.



Noctilucent cloud display over Clearview WA on July 15<sup>th</sup> 2009 – Mark Folkerts

Following the 1908 explosion, known as the Tunguska Event, the night skies shone brightly for several days across Europe, particularly Great Britain -- more than 3,000 miles away. Kelley said he became intrigued by the historical eyewitness accounts of the aftermath, and concluded that the bright skies must have been the result of noctilucent clouds. The comet would have started to break up at about the same altitude as the release of the exhaust plume from the space shuttle following launch. In both cases, water vapor was injected into the atmosphere.

The scientists have attempted to answer how this water vapor traveled so far without scattering and diffusing, as conventional physics would predict. *"There is a mean transport of this material for tens of thousands of kilometers in a very short time, and there is no model that predicts that,"* Kelley said. *"It's totally new and unexpected physics."*

This "new" physics, the researchers contend, is tied up in counter-rotating eddies with extreme energy. Once the water vapor got caught up in these eddies, the water traveled very quickly -- close to 300 feet per second.



Noctilucent clouds observed from Donnelley Dome near Fairbanks, Alaska, resulting from a post-space shuttle plume in August 2007 (M.J. Taylor and C.D. Burton/Utah State University).

Scientists have long tried to study the wind structure in these upper regions of the atmosphere, which is difficult to do by such traditional means as sounding rockets, balloon launches and satellites, explained Charles Seyler, paper co-author. "Our observations show that current understanding of the mesosphere-lower thermosphere region is quite poor," Seyler said. The paper is also co-authored by physicist Miguel Larsen, Ph.D. a former student of Kelley. <http://www.news.cornell.edu/stories/June09/cloud.jpg>

## MARTIAN CLIMATE CYCLES

Four papers this week offer new details about the history of water on Mars, gleaned from the 2008 Phoenix Mars Mission. Peter H. Smith, the mission's principal investigator, is the first author of "H<sub>2</sub>O at the Phoenix Landing Site". Smith and his group of scientists and students used the lander to investigate the role of water and ice on Mars, as well as the changing weather patterns. The popular mission launched in early August 2007. In May, 2008, early 10 months later, its landing trajectory was spectacularly captured by the HiRISE camera onboard the Mars Reconnaissance Orbiter.

For the next five months, the Science Operations Center clattered with researchers gearing themselves to follow the Martian diurnal phases, which are about 40 minutes longer than day and night on Earth and enough to throw off human sleep schedules in short order.

The landing site was an ejecta field. A comet or asteroid that crashed into the surface melted the ice below creating a sheet of dust and water that flowed across a shallow valley. Smith said that event also covered any large rocks that could have interfered with the ability of the Phoenix to safely land.

Smith and his group found patterns in the ground near the lander, multi-sided shapes about three to ten meters in size. The shapes are created when the surface contracts and the ice cracks. Sand fills in the cracks before the ice expands and buckles the surface to make the distinctive patterns.

Smith used the Phoenix lander's robotic arm to dig a series of trenches to expose subsurface ice and found that the ice in the centers of the polygons was fairly shallow, only a couple of inches deep.

*"But in the troughs in between, we went down as much as eight inches and never did find the ice underneath. We weren't able to dig further down because the robot arm was hitting against the side of the lander. It was not known ahead of time that there would be changes in the depth of the ice,"* he said. *"We wanted to know the origin of the ice,"* Smith said. *"It could have been the remnant of a larger polar ice cap that shrank; could have been a frozen ocean; could have been a snowfall frozen into the ground,"* he said.

*"The most likely theory is that water vapor from the atmosphere slowly diffused into the surface and froze at the level where the temperature matches the frost point. We expected that was probably the source of the ice, but some of what we found was surprising."*

One of the surprises was finding perchlorate. *"Perchlorate was not predicted at this landing site and nobody had it on their list of likely chemicals. There was a very high concentration of it, higher than the salts we might have expected like sodium chloride (table salt). As an oxidized state of chlorine, it has interesting properties including a strong affinity for water. On Earth, microbes use it as a chemical energy source."*

During the mission, Mars moved from summer to winter, giving Smith and others an unprecedented look at the planet's changing weather patterns, including frost and snow. *"Frost was predicted, but snowfall*

was quite a welcome surprise," Smith said. "In summer there was a lot of dust in the atmosphere. As we neared fall, the dust cleared, and all of a sudden there were water ice clouds forming at about 4 km (2.5 mi.) above the surface. We could see the clouds scud by, moving through the camera field, and once we saw snow coming out of the bottom of a cloud. It was very exciting to watch the daily weather changes. No one has ever had this experience."

Smith said there are clues that thin films of water modified the soil chemistry. Unlike Earth, Mars has an unstable spin axis, which currently is tilted at about 25 degrees from vertical. Perhaps five millions years ago, he said, it was tilted much more, which would have exposed the north pole to larger amounts of sunlight creating warmer, wetter conditions during summer.

"During that previous climate, you would expect huge increase in the amounts of water vapor coming off the polar cap. If the cap goes unstable, you can have as much as three hundred times as much water in the atmosphere," Smith said.

It would have been enough for snowdrifts. On hot summer days, melting snow could have formed thin films of water. Not enough for a lake or a river, but he said this could have been a time when damp soil provided a growth period for any microbes that learned to survive those long periods of dryness. "Who knows? Evolution is a powerful force. If life ever started on Mars, there are niches where still it could survive."

### SCIENTISTS FIND CLUES TO THE WATER CYCLE ON MARS

According to the first findings from the Phoenix Mars Lander mission, snow and water-ice clouds play a crucial role in the exchange of water between the atmosphere and surface of Mars, which suggests that the Red Planet is even more like Earth than previously thought.

The surprise discovery of Martian snow in 2008 by the weather station on Phoenix Mars lander helps explain how the water cycle on Mars behaves, especially the seasonal increase of the Martian polar caps in winter and their consequent shrinking in summer. The science team's paper, entitled "Mars Water-Ice Clouds and Precipitation," describes how water vapor is lofted upwards during the daytime, forming clouds of ice-crystals low in the atmosphere that resemble cirrus clouds on Earth. Water then precipitates through the atmosphere at night in the form of snow.

"It's similar to the phenomenon known as 'diamond dust' in the Arctic. If you look up into the Arctic night sky, you see fine ice crystals falling softly towards you," said Jim Whiteway, lead scientist for Phoenix's Meteorological Station. "You can still see the stars but it is like a continuous, light snowfall in the form of ice crystals."

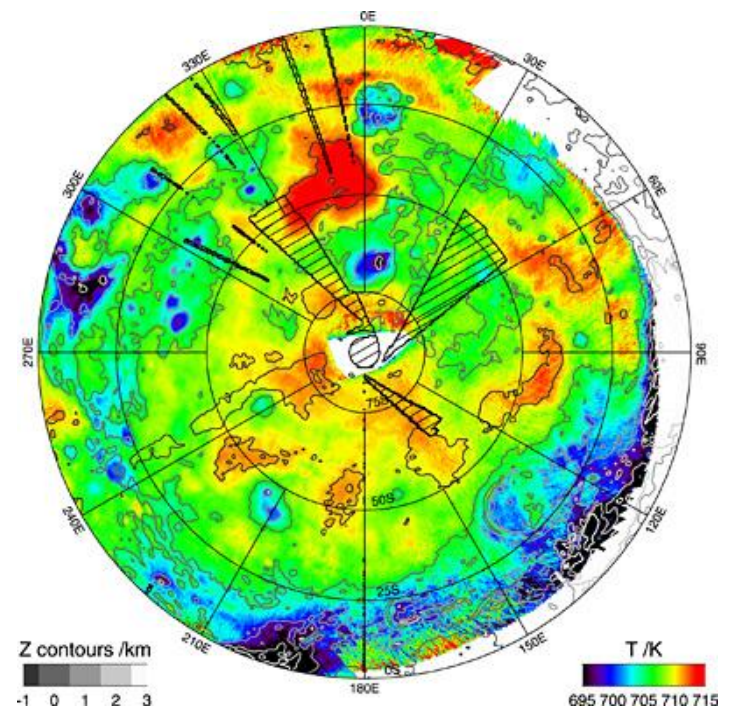
Prior to the Phoenix mission, scientists had not anticipated precipitation on Mars, nor had they predicted that clouds would form as low as they did. "We knew that the polar ice cap advanced as far south as the Phoenix site in winter, but we didn't know how the water vapor moved from the atmosphere to ice on the ground," said Whiteway. "Now we know that it does snow, and that this is part of the hydrological cycle on Mars."

Within hours of landing, Phoenix's Meteorological Station began beaming back data on the temperature and pressure at the landing site, and measured dust, clouds and fog in the lower atmosphere. The warmest temperature recorded during the mission was minus 19.6 degrees Celsius, with the coldest at minus 97.7 degrees Celsius. The LIDAR instrument on Phoenix (a shoe-boxed sized laser instrument) probed the Martian atmosphere daily throughout the mission for a

total of approximately 137 hours of operating time (about 1 hour each Martian day), emitting 49,423,600 laser shots. Perched at the top of the meteorological station's mast, the wind indicator (known as the "telltale"), measured wind speed and direction and detected the presence of several dust devils at the landing site. Winds at the Phoenix landing site were typically between 3-5 meters/second (11-18 km/h), which increased to an average of about 10 m/s (36 km/h) during the last 50 Sols of the mission, when winter weather started to set in. The highest recorded wind speed was 16 m/s (58 km/h).

### NEW MAP HINTS AT VENUS' WET, VOLCANIC PAST

Venus Express has charted the first map of Venus' southern hemisphere at infrared wavelengths. The new map hints that our neighboring world may once have been more Earth-like, with a plate tectonics system and an ocean of water. The map comprises over a thousand individual images, recorded between May 2006 and December 2007. Because Venus is covered in clouds, normal cameras cannot see the surface, but Venus Express used a particular infrared wavelength that can see through them.



New Radar map of Venus' Southern Hemisphere – Image credit: ESA

Although radar systems have been used in the past to provide high-resolution maps of Venus' surface, Venus Express is the first orbiting spacecraft to produce a map that hints at the chemical composition of the rocks. The new data are consistent with suspicions that the highland plateaus of Venus are ancient continents, once surrounded by ocean and produced by past volcanic activity. "This is not proof, but it is consistent. All we can really say at the moment is that the plateau rocks look different from elsewhere," says Nils Muller, who headed the mapping efforts.

The rocks look different because of the amount of infrared light they radiate into space, similar to the way a brick wall heats up during the day and gives off its heat at night. Besides, different surfaces radiate different amounts of heat at infrared wavelengths owing to a material characteristic known as emissivity. The Visible and Infrared Thermal Imaging Spectrometer (VIRTIS) instrument captured this infrared

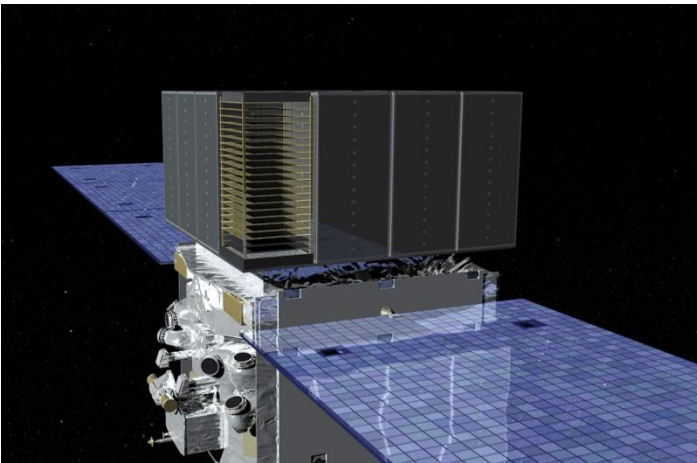
radiation during Venus Express' night-time orbits around the planet's southern hemisphere.

The eight Russian landers of the 1970s and 1980s touched down away from the highlands and found only basalt-like rock beneath their landing pads. The new map shows that the rocks on the Phoebe and Alpha Regio plateaus are lighter in color and look old compared to the majority of the planet. On Earth, such light-colored rocks are usually granite and form continents. Granite is formed when ancient rocks, made of basalt, are driven down into the planet by shifting continents, a process known as plate tectonics. The water combines with the basalt to form granite and the mixture is reborn through volcanic eruptions. "If there is granite on Venus, there must have been an ocean and plate tectonics in the past," says Muller. Muller points out that the only way to know for sure whether the highland plateaus are continents is to send a lander there. Over time, Venus' water has been lost to space, but there might still be volcanic activity. The infrared observations are very sensitive to temperature. But in all images they saw variations of only 20°C, instead of the kind of temperature difference they would expect from active lava flows.

Although Venus Express did not see any evidence of ongoing volcanic activity this time around, Muller does not rule it out. "Venus is a big planet, being heated by radioactive elements in its interior. It should have as much volcanic activity as Earth," he says. Indeed, some areas do appear to be composed of darker rock, which hints at relatively recent volcanic flows. The new map gives astronomers another tool in their quest to understand why Venus is so similar in size to Earth and yet has evolved so differently. [http://www.esa.int/SPECIALS/Venus\\_Express/SEMUQCLXOWF\\_0.html](http://www.esa.int/SPECIALS/Venus_Express/SEMUQCLXOWF_0.html)

## FERMI PROBES DOZENS OF GAMMA-RAY PULSARS

With the Fermi Gamma-ray Space Telescope, astronomers now are getting their best look at those whirling stellar cinders known as pulsars. In two studies, international teams have analyzed gamma-rays from two dozen pulsars, including 16 discovered by Fermi. Fermi is the first spacecraft able to identify pulsars by their gamma-ray emission alone.



Fermi Spacecraft – Image credit: NASA

A pulsar is the rapidly spinning and highly magnetized core left behind when a massive star explodes. Most of the 1,800 cataloged pulsars were found through their periodic radio emissions. Astronomers believe these pulses are caused by narrow, lighthouse-like radio beams emanating from the pulsar's magnetic poles. "Fermi has truly

unprecedented power for discovering and studying gamma-ray pulsars," said Paul Ray. "Since the demise of the Compton Gamma Ray Observatory a decade ago, we've wondered about the nature of unidentified gamma-ray sources it detected in our galaxy. These studies from Fermi lift the veil on many of them."

The Vela pulsar, which spins 11 times a second, is the brightest persistent source of gamma rays in the sky. Yet gamma rays -- the most energetic form of light -- are few and far between. Even Fermi's Large Area Telescope sees only about one gamma-ray photon from Vela every two minutes. "That's about one photon for every thousand Vela rotations," said Marcus Ziegler, a member of the team reporting on the new pulsars. "From the faintest pulsar we studied, we see only two gamma-ray photons a day."

Radio telescopes on Earth can detect a pulsar easily only if one of the narrow radio beams happens to swing our way. If not, the pulsar can remain hidden. A pulsar's radio beams represent only a few parts per million of its total power, whereas its gamma rays account for 10 percent or more. Somehow, pulsars are able to accelerate particles to speeds near that of light. These particles emit a broad beam of gamma rays as they arc along curved magnetic field lines.

The new pulsars were discovered as part of a comprehensive search for periodic gamma-ray fluctuations using five months of Fermi Large Area Telescope data and new computational techniques. "Before launch, some predicted Fermi might uncover a handful of new pulsars during its mission," Ziegler added. "To discover 16 in its first five months of operation is really beyond our wildest dreams."

Like spinning tops, pulsars slow down as they lose energy. Eventually, they spin too slowly to power their characteristic emissions and become undetectable. But pair a slowed dormant pulsar with a normal star, and a stream of stellar matter from the companion can spill onto the pulsar and increase its spin. At rotation periods between 100 and 1,000 times a second, ancient pulsars can resume the activity of their youth. In the second study, Fermi scientists examined gamma rays from eight of these "born-again" pulsars, all of which were previously discovered at radio wavelengths. "Before Fermi launched, it wasn't clear that pulsars with millisecond periods could emit gamma rays at all," said Lucas Guillemot. "Now we know they do. It's also clear that, despite their differences, both normal and millisecond pulsars share similar mechanisms for emitting gamma rays." <http://www.nasa.gov/fermi>  
[http://www.nasa.gov/mission\\_pages/GLAST/news/pulsar\\_passel.html](http://www.nasa.gov/mission_pages/GLAST/news/pulsar_passel.html)

## FROM THE EDITOR'S TERMINAL

*The Stargazer* is your newsletter and therefore it should be a cooperative project. Ads, announcements, suggestions, and literary works should be received by the editor at least two weeks prior to the next upcoming scheduled EAS meeting.

If you wish to contribute an article or suggestions to *The Stargazer* please contact Mark Folkerts by email or by telephone (425) 486-9733 or co-editor Bill O'Neil, at (774) 253-0747.



## The Star Gazer

P.O. Box 12746  
Everett, WA 98206

### In July's StarGazer:

- \*\*\*\* ASTRO CALENDAR - UPCOMING ASTRONOMY EVENTS
- \*\*\*\* OBSERVER'S INFORMATION - SUN, MOON, AND PLANET VISIBILITY
- \*\*\*\* UP IN THE SKY -- THE PLANETS (AND PLUTO)
- \*\*\*\* WESTERN US STAR PARTIES THIS SEASON
- \*\*\*\* CONSTELLATION OF THE MONTH
- \*\*\*\* MIRROR IMAGES
- \*\*\*\* YOUNG ASTRONOMER'S CORNER
- \*\*\*\* ASTRONOMY AND TELESCOPE "LINGO"
- \*\*\*\* ASTRONOMY "FUN FACTS"
- \*\*\*\* SALT FINDING FROM CASSINI HINTS AT OCEAN IN ENCELADUS
- \*\*\*\* BRINGING LIGHT TO MOON'S PERMANENTLY DARK CRATERS
- \*\*\*\* SPACE STATION ROOM WITH A SPECTACULAR VIEW
- \*\*\*\* ROVER YIELDING CLUES WHILE LODGED IN MARTIAN SOIL
- \*\*\*\* MYSTERY OF THE MISSING SUNSPOTS, SOLVED?
- \*\*\*\* BABY STARS FINALLY FOUND IN JUMBLED GALACTIC CENTER
- \*\*\*\* MYSTERY SOLVED: SPACE SHUTTLE SHOWS 1908 TUNGUSKA EXPLOSION WAS CAUSED BY A COMET
- \*\*\*\* MARTIAN CLIMATE CYCLES
- \*\*\*\* SCIENTISTS FIND CLUES TO THE WATER CYCLE ON MARS
- \*\*\*\* FERMI PROBES DOZENS OF GAMMA-RAY PULSARS
- \*\*\*\* NEW MAP HINTS AT VENUS' WET, VOLCANIC PAST

**The next EAS Meeting is 7:00 PM Saturday July 18<sup>th</sup> at Jim Bielaga's home location at Camano Island - It is a pot-luck dinner, telescope clinic, and star party.**