

# The Stargazer

August 2007

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

See EAS website at:

[http://members.tripod.com/everett\\_astronomy](http://members.tripod.com/everett_astronomy)

## EAS BUSINESS...

**NEXT EAS MEETING – SATURDAY AUGUST 25TH<sup>H</sup>  
 AT 3:00 PM AT THE EVERETT PUBLIC LIBRARY, IN  
 THE AUDITORIUM (DOWNSTAIRS)**

### ★★ Saturday August 25th MEETING PROGRAM: ★★

This Saturday August 25<sup>th</sup>, the program will be 'The Death of a Star', and will have star party slides from Mark Folkerts from ALCON, Shingletown and Mt. Bachelor star parties.

Map to library - <http://www.epls.org/about/mlmap.htm>

**2702 Hoyt Avenue  
 Everett, WA 98201**

Directions to library - <http://www.epls.org/about/mldirect.htm>

### ★ STAR PARTY INFO ★

**Upcoming EAS star party schedule: (also see the regional star parties listed in the 'Astro Calendar for 2007')**

#### **EAS Star Party - Saturday September 08 - weather permitting.**

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@nwlinc.com](mailto:tam1951@nwlinc.com)) 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.

**Sep 08 - Saturday**

**Sep 15 - Saturday**

**Oct 13 - Saturday**

**Nov 10 - Saturday**

Other dates may be available, but these coincide with times around the new moon, and any conflicts we may have.

#### **SAS Brooks Memorial Star Party – Sep 13-16**

"Hi all - A reminder that the annual Seattle Astronomical Society's club star party is scheduled for the weekend of September 13-16th at Brooks Memorial State Park, just north of Goldendale. Drive time from Shoreline to the camp grounds is 4 hours on excellent roads. The following site gives basic information about the park and what is available in the immediate area for those who might like to do some sight seeing. <http://www.parks.wa.gov/parkpage.asp?selectedpark=Brooks+Memorial&pageno=2> We will be in the Group Camp Site located on the left side of the highway going south. Fee for the event will be 10 dollars per adult (kids free) and covers your entire stay. I will collect on site. Site is about 2500 feet in elevation, with excellent dark skies. Viewing to the north and south is excellent, the east has a ridge line restricting ones viewing to objects above 20 degrees. Viewing to the west can be a challenge due to trees. Look forward to seeing you all there. - Karl R Schroeder, 15761 Palatine Ave N, Shoreline, WA. 98133, (206) 362-7605" [KSchroe225@aol.com](mailto:KSchroe225@aol.com)

#### **Olympic Astro Society Camp Delaney Star Party – Sep 6-9**

"Hello - My name is Cliff Mygatt and I am the president of the Olympic Astronomical Society (OAS) in Bremerton. The OAS is holding our annual Fall star party at Camp Delaney at Sun Lakes State Park. Members of your society (EAS) have attended in the past and are welcome as always. The dates are the 6th to 9th of September, and I have a sign up form you may feel free to distribute to your members. (Please pre-register if you plan to attend – no drop ins). The mailing address is listed on the second page of form. If you have questions, feel free to drop me a line. -Cliff [cliffon.mygatt@navy.mil](mailto:cliffon.mygatt@navy.mil)"

**Please also join the EAS mail list, and send mail to the mail list [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.

**\$\$ - FINANCIAL HEALTH - \$\$**

The club maintains a \$950+ balance. We try to keep approximately a \$500 balance to allow for contingencies. .

**CLUB SCOPES**

SCOPE	LOAN STATUS
10-INCH WARD DOBSONIAN	ON LOAN
10-INCH SONOTUBE DOBSONIAN	AVAILABLE
8-INCH DOBSONIAN	AVAILABLE

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

**EAS MEMBER NEWS**

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

*“Show your club membership card at Jim Bielaga’s new astronomy store ‘Aurora Astro Products’ and receive a 10% discount on all purchases. This is an exclusive discount to 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”*



**Aurora Astro**

**Aurora Astro Products**  
11419 19th Avenue SE #A102  
Everett, WA 98208  
425-337-4384

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

Open Monday - Friday 9:00 am to 6:00 pm  
Saturday 10:00 am to 5:00 pm  
Over 37 product dealerships, and growing

**Does Anyone know about the history of the EAS ???**

The Northwest Region of the Astronomical League (NWRAL) is putting together a new website and needs the following information from each club of the NWRAL. The EAS is looking for any information from members about the early history. Please contact Mark Folkerts if you have any info that could be of help. NWRAL would like a brief history of the club

- Club established date
- Who started the club
- When club joined the Astronomical League.

**ASTRO CALENDAR FOR 2007****August 2007**

Aug 01 - Alpha Capricornids Meteor Shower Peak  
**Aug 3-4 - ALCON 2007 Portland Oregon** - <http://www.alconexpo.com>  
 Aug 06 - Southern Iota Aquarids Meteor Shower Peak  
**Aug 8-12 - Mt Bachelor Star Party** - <http://www.mbsp.org/>  
**Aug 11 - Saturday, EAS Star party at Ron Tam's**  
 Aug 11 - Silver Falls (OR) Star Party - [http://www.oregonstateparks.org/park\\_211.php](http://www.oregonstateparks.org/park_211.php)  
 August 11 - ICAS Artist Point Lookout Star Party - <http://groups.msn.com/WashingtonICAS/memberonlyevents.msnw>  
 Aug 11-19 Mt. Kobau Star Party - <http://www.mksp.ca/>  
 Aug 12 - Perseids Meteor Shower Peak  
 Aug 11 - OAS Hurricane Ridge Star Party - [http://www.olympicastronomicalsociety.com/hurricane\\_ridge\\_star\\_parties.htm](http://www.olympicastronomicalsociety.com/hurricane_ridge_star_parties.htm)  
**Aug 16-19 - Oregon Star Party** - <http://www.oregonstarparty.org/>  
 Aug 24-26 - RASCal's Star Party - <http://victoria.rasc.ca/events/StarParty/>  
**Aug 25 - EAS Meeting – Everett Public Library Auditorium - 3:00pm**  
 Aug 25 - Northern Iota Aquarids Meteor Shower Peak  
 Aug 28 - Total Lunar Eclipse - entire eclipse visible

**September 2007**

Sep 03 - Labor Day Holiday  
 Sep 6-9 - OAS Camp Delaney Fall Star Party - <http://www.olympicastronomicalsociety.com/Documents/CAMP%20DELANY%20V2.pdf>  
**Sep 08 - Saturday, EAS Star party at Ron Tam's**  
 Sep 6-9 Alberta Star Party - <http://calgary.rasc.ca/asp2007.htm>  
 Sep 15 – Fall 2007 ASTRONOMY DAY - Tentative star party  
**Sep 13-16- SAS annual Star Party - Brooks Memorial State Park**  
 Sep 14-16 - Klickitat County Star Party - <http://www.klickitatstarparty.net/>  
 Idaho Star Party, September 9-11, 2005 Boise Astronomical Society <http://www.boiseastro.org/>  
**Sep 19 - Saturday, EAS Star party at Ron Tam's**  
**Sep 20-23 - Orion Nebula Star Party** - <http://www.seattleastro.org/orionnebsp.html>  
**Sep 22 - EAS Meeting – Everett Public Library Auditorium - 3:00pm**  
 Sep 23 - Autumnal Equinox (09:51 UT)  
 Merritt Star Quest - <http://www.merrittastronomical.com/>

**October 2007**

Oct 09 - Draconids Meteor Shower Peak  
**Oct 13 - Saturday, EAS Star party at Ron Tam's**  
 Oct 14 - Dwarf Planet 136199 Eris Closest Approach To Earth (95.8AU)  
 Oct 12-14 - Klickitat County Star Party - <http://www.klickitatstarparty.net/>  
 Oct 21 - Orionids Meteor Shower Peak  
 Oct 31 - Halloween

**November 2007**

Nov 03 - Taurids Meteor Shower Peak  
 Nov 04 - End Daylight Saving time - Set Clock Back 1 Hour (US)  
**Nov 10 - Saturday, EAS Star party at Ron Tam's**  
 Nov 12 - Dwarf Planet Ceres Closest Approach To Earth (1.832 AU)  
 Nov 17 - Leonids Meteor Shower Peak  
 Nov 22 - Thanksgiving Holiday

**December 2007**

Dec 07 - 35th Anniv (1972), Apollo 17 Launch (Last Mission to Moon)  
 Dec 13 - Geminids Meteor Shower Peak  
 Dec 22 - Winter Solstice, 22:06 UT  
 Dec 22 - Ursids Meteor Shower Peak  
 Dec 24 - Mars at opposition  
 Dec 25 - Christmas Holiday

**UW Astronomy Speakers Colloquium Schedule**

The Astronomy Department weekly colloquium meets Thursdays at 4:00 pm in PAB A102 - the classroom part of the Physics/Astronomy Building complex, (or 11:30 in C520). [www.astro.washington.edu/dept/colloquium.html](http://www.astro.washington.edu/dept/colloquium.html)

## ON THE AIRWAVES - KSER 90.7 - 'IT'S OVER YOUR HEAD'

"Our group of radio script writers now consists of EAS and SAS members Jim Ehrmin, Greg Donohue, and Ted Vosk, who are now regularly writing and helping to produce our **astronomy radio show, "It's Over Your Head"** on radio station **KSER, FM 90.7**. The six-minute segment is broadcast **every Wednesday morning at approximately 7:20 A.M.** and gives a weekly look at what's up in the sky over Snohomish County, with other information. If you are a listener to the program, show your support by giving the program director of KSER a call!" Web page with lots of archives and other info is available at <http://www.itsoveryourhead.org/>

**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.

## EAS MEMBERSHIP BENEFITS & INFORMATION

### EAS Benefits -

Membership in the **Everett Astronomical Society (EAS)** includes invitations to all of the club meetings and star parties, plus the monthly newsletter, **The Stargazer**. Currently, a 10% discount is also being offered to EAS members for purchases at Aurora Astro Products in Everett

### Magazine Discounts -

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

[http://members.tripod.com/everett\\_astronomy/application.htm](http://members.tripod.com/everett_astronomy/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, which is maintained by Mike Locke, 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. 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. See list here: [http://members.tripod.com/everett\\_astronomy/eas\\_library.htm](http://members.tripod.com/everett_astronomy/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://members.tripod.com/everett\\_astronomy/application.htm](http://members.tripod.com/everett_astronomy/application.htm)

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

## OBSERVER'S INFORMATION...

### LUNAR FACTS

Aug 05	Last Quarter Moon
Aug 12	New Moon
Aug 20	First Quarter Moon
Aug 28	Full Moon
Sep 04	Last Quarter Moon
Sep 11	New Moon
Sep 19	First Quarter Moon
Sep 26	Full Moon
Oct 03	Last Quarter Moon
Oct 11	New Moon
Oct 19	First Quarter Moon
Oct 26	Full Moon

### 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)

### UP IN THE SKY -- THE PLANETS

Object	Rises	Sets	Con	Mag
Sun	05:17am	19:06	Leo	-27.5
Mercury	07:06amt	20:35	Leo	+0.9
Venus	05:41am	18:50	Can	-4.0
<b>Mars</b>	<b>23:49am</b>	<b>15:24</b>	<b>Tau</b>	<b>+0.3</b>
<b>Jupiter</b>	<b>15:13</b>	<b>23:51</b>	<b>Oph</b>	<b>-2.1</b>
Saturn	05:57am	20:05	Leo	+0.6
<b>Uranus</b>	<b>20:33</b>	<b>07:46am</b>	<b>Aqr</b>	<b>+5.7</b>
<b>Neptune</b>	<b>19:33</b>	<b>05:20am</b>	<b>Cap</b>	<b>+7.8</b>
<b>Pluto</b>	<b>15:55</b>	<b>01:26am</b>	<b>Sag</b>	<b>+13.9</b>

(times local time for Everett PDT)

### Observing Jupiter's Moons - Java tool

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

### Transit times for Jupiter's Great Red Spot in 2007

<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.srb.noaa.gov/highlights/sunrise/gen.html>

### INTERNATIONAL SPACE STATION - VISIBLE SEATTLE PASSES

#### ISS Visibility -

<http://spaceflight.nasa.gov/realdata/sightings/SSapplications/Post/SightingData/Seattle.html>

#### Heavens Above:

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

### CONSTELLATIONS OF THE MONTH (LACERTA, SAGITTA, AQUARIUS)

**LACERTA: (The Lizard).** With a midnight culmination date of August 28th, Lacerta (pronounced "luh-sir'-tuh") is well-placed for summer viewing. Lacerta borders on the constellations of

Andromeda, Cassiopeia, Cepheus, Cygnus, and Pegasus, and contains no asterisms. Lacerta ranks 13th in overall brightness among the constellations, but 68th in size; it takes up approximately 201 square degrees of the sky (0.487%). Lacerta contains no known meteor showers and no Messier objects. This constellation is completely visible from latitudes North of  $-33$  degrees, and completely invisible from latitudes South of  $-55$  degrees. It has 23 stars brighter than magnitude 5.5, and its central point is at RA=22h25m, Dec.= +46 degrees. The solar conjunction date of Lacerta is February 27th.

Lacerta is one of the seven constellations still in use invented by Johannes Hevelius; it was included in a 1690 star atlas accompanying his stellar catalogue. While Lacerta has no meteor showers or Messier objects, it does contain one very important object to astronomy. BL Lacertae (BL Lac) is a very distant, extremely compact, and violently variable extragalactic object resembling a quasar in both size and energy output, and is the prototype for similar objects in the sky. BL Lac objects are different from quasars however, in that they appear to be related to distant elliptical galaxies (and indeed most appear to lie within elliptical host galaxies), and because there are no lines (neither emission or absorption) in their spectra (although some may demonstrate very weak emission lines during periods of faint luminosity). Lack of emission or absorption lines hampers distance measurements. However, surrounding nebulosity does contain weak absorption lines, making it possible to measure a redshift. BL Lac objects are a form of active galaxy, and about 100 of them are known. BL Lac objects are most easily identified from X-ray and radio surveys (most known ones are strong radio sources), but the peak of their emission lies in the infrared (similar to quasars). BL Lac objects demonstrate intense magnetic fields, which rapidly vary in both strength and direction; these objects are also violently variable in luminosity at all wavelengths, and can flare up to five magnitudes brighter in a matter of only a few weeks. BL Lac objects are most prevalent in the low-redshift universe; as a result, their space distribution appears very different from other active galaxies, including quasars.

**SAGITTA: (The Arrow).** With a midnight culmination date of July 16th, Sagitta (pronounced "suh-gee'-tah") is well-placed for summer viewing. It contains no asterisms, but the stars of the constellation do trace out an arrow in the sky, situated approximately between the constellations of Aquila and Cygnus, its point pointing roughly towards the dolphin that is the constellation Delphinus. Besides Aquila and Delphinus (it does not officially border Cygnus), Sagitta also officially borders on the constellations of Vulpecula and Hercules. Sagitta ranks 18th in overall brightness among the constellations, but 86th in size; it takes up approximately 80 square degrees of the sky (0.194%). It contains no known meteor showers, but does contain one Messier object: M-71. Sagitta is completely visible from latitudes North of  $-69$  degrees, and completely invisible from latitudes South of  $-74$  degrees. It has 8 stars greater than magnitude 5.5, and its central point is at RA=19h37m, Dec.= +18.5 degrees. The solar conjunction date of Sagitta is January 15th. Sagitta is one of only two constellations whose abbreviation (Sge) contains a letter ('e') not found in the name of the constellation (the other constellation with this minor distinction is Hydrus). The famous legend of Sagitta the Arrow commemorates the magic arrow of Hercules, which was used to kill Jupiter's pet eagle Aquila. Aquila had been inflicting repeated attacks on the chained Prometheus (who had stolen fire for use by earthly mortals without Jupiter's permission). Hercules sympathized with Prometheus and his rationale for stealing fire for use by mortals, and thus wanted to protect Prometheus from the repeated peckings and barrages of Aquila. He used his magic arrow (Sagitta) to kill Aquila in order to spare

Prometheus these repeated attacks. M-71 (NGC-6838) is a globular cluster with a total magnitude of 8.3, visible as a very loose bright cluster of over 100 stars, 7' across in a 12-inch telescope. Most of the component stars appear to be of 11th and 12th magnitude. M-71 lies midway between the 4th magnitude stars of Gamma and Delta Sagittae. Astronomers thought for many years that rather than being a globular, M-71 was actually a very rich open cluster; most astronomers now believe that it is indeed a globular, but an unusually loose one, not as compact and without the strong central stellar condensation typical of normal globular clusters. Other objects of interest within the constellation of Sagitta include Harvard 20, an open cluster less than one degree SW of M-71, and three planetary nebulae suitable for amateur telescopes: NGC-6879, IC-4997, and NGC-6886. Sagitta also contains some unusual stars, notably WZ-Sagittae, FG-Sagittae, and V-Sagittae. WZ-Sagittae is a recurring nova, which last had an outburst in 1978; this resulted in its normal 15th magnitude brightening to 7th magnitude; it is expected to have another outburst around the year 2010. FG Sagittae is an unusual variable star, which progressively brightened (to about magnitude 9.5 from 13.7) for 75 years until the early 1970's, and currently appears to be surrounded by a slender nebulosity. V-Sagittae is an erratic variable star which varies irregularly between magnitudes 9.5 and 13.9 with overlapping periods of variability; this leads astronomers to believe that it may have been a nova at one time, or may indeed soon become one. Try to enjoy the beautiful and very interesting wonders of Sagitta this summer star party season.

**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 Albali 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.

#### PLANETARY FOCUS

The "Planetary Focus" column appears periodically in the EAS newsletter, and will return in September.

#### YOUNG ASTRONOMER'S CORNER - STAR PARTY

Since it officially remains Star Party season, this month the Young Astronomer's Corner will repeat a very timely topic in

**amateur astronomy: Star Parties!!** If you can go to an official Star Party this summer with family or friends, such as the Orion Nebula Star Party at Table Mountain in Ellensburg, you should. And less formal Star Parties given year-round and locally by amateur astronomers are also lots of fun. It is a wonderful experience to look at the beautiful night skies, and to meet lots of great people and perhaps make new friends. Your experience can be even more enjoyable if you follow a few certain practices that are tried and true in amateur astronomy circles, to help make your experience the most enjoyable and rewarding it can be. Some of these suggestions may even be star party rules that must be followed in courtesy to other observers (these rules will be noted as such). So if you follow these rules and specific practices, you're sure to have a great time at the next Star Party you attend: **Star Parties: Hints for More Enjoyable Stargazing (and Outdoor Pursuits in General) !!!**

★★ Dress warmly, or be prepared to dress warmly. Just because the evening starts out warm, it doesn't necessarily mean that it will end up that way. So take warm clothes with you just in case.

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

★★ Make sure you have a good hat that covers the ears, and also good gloves as well. Polypropylene glove liners make excellent astronomy gloves because they are not bulky, making it easier to use flashlights, eyepieces, and charts, for example.

★★ Never underestimate the power of a good hooded piece of clothing. Wearing a hood cuts down, and can sometimes almost eliminate, cool or cold wind from going down your neck and down your back or front. Wearing a hood serves two purposes: it cuts down on the aforementioned wind, and also helps to keep body heat in, as the head radiates more heat away from the body than any other area. A good hat that covers the ears is also essential in keeping body heat in.

★★ Always wear warm socks. Again, socks that conserve heat and take moisture away from the skin (such as polypropylene or wool) are excellent. It doesn't hurt to have an extra pair or two on hand either just in case it's extra nippy for you.

★★ A good windbreaker (such as Gore-tex or nylon), which also has an integral hood, is an excellent way to conserve body heat and minimize chill, and can be used over other layered clothing as necessary.

★★ Always eat well and drink plenty of fluids to avoid dehydration. Good nutrition (and yes, including carrots or other sources of Vitamin A which improves night vision) and hydration helps to maintain alertness, body warmth (especially by using drinks like hot chocolate), and helps to battle fatigue. Being hungry and thirsty, like in many other areas of life including school work, does not make for an enjoyable experience. Most areas allow camp stoves, but open fires are usually prohibited. Importantly, alcohol and nicotine use can also interfere with the conservation of body heat.

★★ Always follow established Star Party etiquette. Use red flashlights ONLY, and point them downwards so as not to shine them in someone's eyes. Using any color other than red will cause your night adapted vision (the ability to see some contrast in the dark, and to see beautiful telescope objects more clearly) will be interrupted, and will not return to where it was at least for a

good 20 minutes to a half-hour. (Night vision is never perfect, so it is also important to know your immediate surroundings and move slowly and ask questions if you are unsure of them; this helps to protect you from injury and from damaging other people's equipment). The use of red lights is a basic star party rule, and is a courtesy to other astronomers as well. No white lights (including car headlights!) are ever allowed in proximity to an official and large Star Party after darkness has arrived. Note: you may also want to have extra batteries for your red light, just in case.

★★ Everybody has different tastes in music. If you would like to listen to music while you observe, it is best and most often a Star Party rule (as well as a courtesy to your neighbors) to wear headsets. Star Parties may also have rules about pets, so be sure to check those rules out as well. If they are allowed, they should not be roaming freely.

★★ Always ask an amateur astronomer if it is OK to look through his or her scope. They make be taking pictures, or they may want to take a rest for a while without being disturbed. It is common courtesy to always respect another's wishes. Many, if not most, astronomers are very friendly and love to have people look through their telescopes, but always be sure to ask.

★★ Star Parties are frequently held in remote areas. It is never a good idea to go to unknown or remote areas alone. Also remember that such areas are also remote from medical attention. If you have bee-sting allergies, or other potential serious conditions, always be prepared, and be prepared for the fact that you may be an hour or more from medical attention. Always let someone at home know where you are and where you will be, including expected time of arrival back home.

★★ It is not necessary to have a telescope to enjoy a star party. A lawn chair and a blanket, perhaps with a pair of binoculars and a good, basic book of the sky, can give you countless hours of enjoyment and learning about astronomy without spending much money. **IT IS NOT NECESSARY TO SPEND LOTS OF MONEY TO ENJOY THE NIGHT SKY.** Going to a Star Party sponsored by your local astronomy club, or perhaps even joining your local astronomy club, is a GREAT way to learn about astronomy. Star parties also give you the opportunity to meet new people, ask lots of questions (and perhaps share your knowledge of astronomy too), as well as to look through many telescopes and possibly binoculars as well.

★★ Finally, respect for your fellow astronomers by following the simple rules as listed above, and respect for the environment (never leave trash around, and stay away from fragile areas of grass and wilderness) will also make your Star Party experience more enjoyable. See you at an upcoming Star Party!!

#### ASTRONOMY AND TELESCOPE LINGO

**ASTRONOMY LINGO: A-TYPE ASTEROID:** A rare class of asteroid with both a moderately high albedo and a reddish spectrum. A spectral absorption characteristic around 1.05 micrometers in the near-infrared is thought to be due to the mineral olivine.

**TELESCOPE LINGO: APERTURE RATIO (OR RELATIVE APERTURE):** The ratio ( $d/f$ ) of the effective diameter 'd' (i.e., aperture) of a lens or mirror to its focal length 'f'. (The ratio 'f/d' is the focal ratio).

**ASTRONOMY LINGO: POLAR CAPS:** Regions of ice that form around the northern and southern poles of a planet or planetary satellite. Earth's caps consist of water ice and snow, while the caps of Mars are composed of both water and frozen carbon

dioxide. The southern polar cap of Neptune's largest moon Triton is pink, and is thought to be due to nitrogen snow and ice. Polar caps may also show seasonal variations.

**TELESCOPE LINGO: KEPLERIAN TELESCOPE:** The first major improvement of the Galilean telescope, developed by Johannes Kepler. A positive (convex) lens was incorporated as the eyepiece, replacing the negative (concave) lens that Galileo used. This gave a larger (but inverted) field of view, and higher magnifications.

#### ASTRONOMY "FUN FACTS"

★★ When the universe was less than one-trillionth of a second old, its radius was approximately one meter, or the size of a large beachball!

★★ There was light at the beginning of the universe, but this optical radiation was trapped in a very dense and hot "cosmic soup" of matter; this early light could not escape for hundreds of thousands of years. Thus, the early universe was opaque.

★★ Our solar system lies about 30,000 light years from the center of our Milky Way galaxy. If one were to drive to the center of the Milky Way at 100 miles per hour (taking a VERY large picnic lunch!!!), it would take your car 6.71 million years to travel just one of those 30,000 light years. In all, it would take a total of 201 billion years to travel to the galactic center!! Are there any "self-serve" stations along the way?

★★ The Milky Way Galaxy is so large, that a powerful flash of light generated at one edge of the Milky Way (and traveling at 186,000 miles/second), would take 100,000 years to reach the other side!! (Another way of saying the same thing: our Milky Way Galaxy is approximately 100,000 light years across!)

★★ Can you go on a multi-trillion mile, and multi-million year, voyage without ever turning back, and still only wind up at your place or origin? Well, technically, yes!! If a star-ship left Earth at about 190,000 miles per hour, in about 115 million years (are there any espresso shops along the way?), it would meet up with the Earth and Sun again because of the rotation of the Milky Way Galaxy. Had it never left Earth, it would have "arrived" at about the same time! Of course, it would have been without all the great adventures of the journey, many of which would have become lore, legend, and conversations of countless new generations, eons before the actual arrival!!!

★★ The great comet of 1843 had a tail that stretched halfway across the sky; it was estimated to be about 500 million miles long (about Jupiter's distance from the Sun). This comet's tail, if wrapped around the Earth's equator, would circle it about 20,000 times!

★★ The sunspot cycle reaches a maximum approximately every 11 years; during that time, the sun is considered to be in its most active phase. One of the largest sunspots ever recorded appeared during one such maximum in 1947, covering more than 1% (one percent) of the solar disk's area. This particular sunspot was estimated to be large enough to contain about 100 Earths (all of which of course would be totally incinerated!).

★★ The massive Hellas basin on Mars was hollowed out by an asteroid with a diameter of at least 100 miles. This asteroid impacted Mars at a velocity of about 36,000 mph, producing an explosion equal to 100 trillion tons of TNT! Just one (1) ton of TNT can destroy a small city block of buildings.

★★ Most sunspots last only a few days; a few however can last about a month, completing a full solar revolution. However, there was a very famous sunspot that was observed around 1840. This

sunspot lasted 18 months(!) – this is 220 times longer than the duration of the worst Earthly hurricane on record!

#### "MIRROR IMAGES" - SUPERGIANT STARS

**"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: IRREGULAR GALAXY:** Galaxies are giant collections of stars, gases, and dust into which most of the visible matter in our universe is located. One type of galaxy is known as an irregular galaxy. Unlike spiral or elliptical galaxies, which have some discernable symmetry, irregular galaxies have no symmetry in either shape or structure. They are highly variable in shape, but all of them are below average galaxy size. These systems contain large amounts of interstellar matter and much gas; the dust concentrations among them can be very variable however. When dwarf galaxies are included in the calculations, only about 10% of the brightest galaxies are irregular. Irregular galaxies contain about 100 million to 30 billion solar masses, and have diameters from 5,000 to 30,000 light years. They are as luminous as 10,000,000 to 2 billion suns, and have an absolute magnitude of anywhere between -13 to -18; they contain both old and young stars. Some galaxies (which used to be classified as irregular) are now more finely classified as starburst, active, and interacting galaxies.

**REPRESENTATIVE NORTHERN HEMISPHERE OBJECT: M-82 (NGC 3034):** This irregular galaxy is the only one of its kind (irregular) to be named as a Messier object. Its year 2000 coordinates are RA=9h 56.2 min, and its Dec.= +69 degrees and 42 seconds. It is about 9x4 minutes of arc in area, and is of magnitude 8.8 visually and 9.4 photographically. M-82 is at about the same distance from earth as it is from its famous neighbor, the spiral galaxy M-81. An eight-inch telescope at high power and with good seeing will show M-82 with a very condensed nucleus, as well as dusty patches crossing its well-defined surface. It has a small spectral red shift of about 325 kilometers per second.

**REPRESENTATIVE SOUTHERN HEMISPHERE OBJECT: Magellanic Clouds (Large (LMC) and Small (SMC)):** Two relatively small irregular galaxies (some texts call the LMC a barred spiral) that are nearby residents to our own Milky Way; both are Southern Hemisphere (only) naked-eye objects. The LMC has a diameter of about 10,000 parsecs, and is at a distance of 50,000 parsecs in the constellation of Dorado. The SMC is about 60,000 parsecs away in the constellation Toucan, and has a diameter of about 6,000 parsecs. Both these galaxies are rich in population I stars (metal-rich), and contain proportionately much more gas than the Milky Way. They share a cloud of cooler neutral hydrogen; this extends into the narrow Magellanic Stream which extends over 100 degrees of the southern sky. The Magellanic Clouds may be gravitationally bound to the Milky Way, but that has not yet been determined, although there appears to be at least some gravitational influence of the Milky Way. The LMC contains the beautiful Tarantula Nebula and the LMC Lagoon, and the SMC contains the magnificent globular Tucanae 47 at its western edge.

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

### COMET MAY HAVE EXPLODED OVER NORTH AMERICA 13,000 YEARS AGO

It may have caused woolly mammoth extinction, global cooling and end of early human Clovis culture. New scientific findings suggest that a large comet may have exploded over North America 12,900 years ago, explaining riddles that scientists have wrestled with for decades, including an abrupt cooling of much of the planet and the extinction of large mammals.

The discovery was made by scientists from the University of California at Santa Barbara and their colleagues. James Kennett, a paleoceanographer, said that the discovery may explain some of the highly debated geologic controversies of recent decades. The period in question is called the Younger Dryas, an interval of abrupt cooling that lasted for about 1,000 years and occurred at the beginning of an inter-glacial warm period. Evidence for the temperature change is recorded in marine sediments and ice cores.

According to the scientists, the comet before fragmentation must have been about four kilometers across, and either exploded in the atmosphere or had fragments hit the Laurentide ice sheet in northeastern North America. Wildfires across the continent would have resulted from the fiery impact, killing off vegetation that was the food supply of many of larger mammals like the woolly mammoths, causing them to go extinct. Since the Clovis people of North America hunted the mammoths as a major source of their food, they too would have been affected by the impact. Their culture eventually died out.

The scientific team visited more than a dozen archaeological sites in North America, where they found high concentrations of iridium, an element that is rare on Earth and is almost exclusively associated with extraterrestrial objects such as comets and meteorites. They also found metallic microspherules in the comet fragments; these microspherules contained nano-diamonds. The comet also carried carbon molecules called fullerenes (buckyballs), with gases trapped inside that indicated an extraterrestrial origin. The team concluded that the impact of the comet likely destabilized a large portion of the Laurentide ice sheet, causing a high volume of freshwater to flow into the north Atlantic and Arctic Oceans. *"This, in turn, would have caused a major disruption of the ocean's circulation, leading to a cooler atmosphere and the glaciation of the Younger Dryas period,"* said Kennett. *"We found evidence of the impact as far west as the Santa Barbara Channel Islands."*  
[http://www.nsf.gov/discoveries/disc\\_summ.jsp?cntn\\_id=109768&org=NSF](http://www.nsf.gov/discoveries/disc_summ.jsp?cntn_id=109768&org=NSF)

### SPITZER FINDS EVIDENCE FOR PLANETS WITH FOUR PARENTS

How many stars does it take to "raise" a planet? In our own solar system, it took only one -- our sun. However, new research from the Spitzer Space Telescope shows that planets might be forming in systems with as many as four stars.

This artist's concept illustrates one such quadruple-star system, called HD 98800. The system is still relatively young, at 10 million years old. One of its two pairs of stars is known to be circled by a dusty disk, which contains materials that are thought to clump together to form planets. When Spitzer set its infrared gaze on the disk, it detected gaps. How did the gaps get there? One possible answer is that planets are growing in size and carving out lanes in the dust.

Spitzer found two gaps in the disk. The inner gap is about as far away from its central stars as Mars and the asteroid belt are from our sun. The outer gap is about as far away from its central stars as Jupiter is from the sun. HD 98800 is located 150 light-years away in the constellation TW Hydrae.



[http://www.nasa.gov/images/content/182895main\\_spitzer-20070724.jpg](http://www.nasa.gov/images/content/182895main_spitzer-20070724.jpg)  
[http://www.nasa.gov/mission\\_pages/spitzer/news/spitzer-20070724.html](http://www.nasa.gov/mission_pages/spitzer/news/spitzer-20070724.html)  
[http://www.nasa.gov/mission\\_pages/spitzer/multimedia/spitzer20070724.html](http://www.nasa.gov/mission_pages/spitzer/multimedia/spitzer20070724.html)

### DIGITAL ARCHIVE CASTS NEW LIGHT ON APOLLO-ERA MOON PICTURES

Nearly 40 years after man first walked on the moon, the complete lunar photographic record from the Apollo project will be accessible to both researchers and the general public on the Internet. A new digital archive -- created through a collaboration between Arizona State and Johnson Space Center -- is making available high-resolution scans of original Apollo flight films. They are at: <http://apollo.sese.asu.edu>

The digital scans are detailed enough to reveal photographic grain. Created from original flight films transported back to Earth from the moon, the archive includes photos taken from lunar orbit as well as from the lunar surface. This is the first project to make digital scans of all the original lunar photographs from Apollo missions. *"This project fulfills a long-held wish of mine. It'll give everyone a chance to see this unique collection of images as clearly as when they were taken,"* says Mark Robinson, professor of geological sciences. Robinson leads the ASU side of the Apollo image digitizing project. Separately, he is the principal investigator for the Lunar Reconnaissance Orbiter Camera, or LROC ([lroc.sese.asu.edu](http://lroc.sese.asu.edu)) -- a suite of three separate, high-resolution imagers on board Lunar Reconnaissance Orbiter, due for launch in October 2008.

The reason the original Apollo images have been so seldom accessed is that they are literally irreplaceable. Between 1968 and 1972, NASA made sets of duplicate images after each moon mission came back to Earth, placing the duplicate sets in various scientific libraries and research facilities around the world. As a result, these second-generation copies (and subsequent copies of copies) are what scientists and the public have seen. The copied images are unsharp and over-contrasty compared to the originals, which have remained in deep-freeze storage at the Johnson Space Center. Even many lunar scientists have not seen or worked with them.

The Apollo digitizing project goes back to the original flight films and scans them in high-resolution detail to reveal their subtleties. Robinson explains, "*We worked with the scanner's manufacturer - Leica Geosystems -- to improve the brightness range that the scans record.*" In technical terms, a normal 12-bit scan was increased to 14-bit, resulting in digital images that record more than 16,000 shades of gray. "*Similarly,*" says Robinson, "*to get all the details captured by the film, we are scanning at a scale of 200 pixels per millimeter.*" This means, he says, the grain of the original film is visible when scans are fully enlarged. The most detailed images from lunar orbit show rocks and other surface features about 40 inches (1 meter) wide. Combining high resolution and wide brightness range produces very large raw image files, notes Robinson. For example, in raw form, the scans of the Apollo mapping (metric) camera frames, each 4.7 inches square, are 1.3 gigabytes in size. "*That's bigger than most people want to look at with a browser,*" says Robinson, "*even if their browser and Internet connection are up to the job.*" So the Web site uses a Flash-based application called Zoomify, which lets users dive deep into a giant image by loading only the portion being examined. Links are available on the site for downloading images in several sizes, up to the full raw scan. The project will take about three years to complete and will scan some 36,000 images. These include about 600 frames in 35 mm, roughly 20,000 Hasselblad 60 mm frames (color, and black and white), more than 10,000 mapping camera frames, and about 4,600 panoramic camera frames. "*These photos have great scientific value, despite being taken decades ago,*" says Robinson. He adds, "*I think they also give everybody a beautiful look at this small, ancient world next door to us.*"

### DREAMY LUNAR ECLIPSE

Close your eyes, breathe deeply, let your mind wander to a distant seashore: It's late in the day, and the western sun is sinking into the glittering waves. At your feet, damp sand reflects the twilight, while overhead, the deep blue sky fades into a cloudy mélange of sunset copper and gold, so vivid it almost takes your breath away.



A breeze touches the back of your neck, and you turn to see a pale full Moon rising into the night. Hmmm. The Moon could use a dash more color. You reach out, grab a handful of sunset, and drape the Moon with phantasmic light. Much better. Too bad it's only a dream... Early Tuesday morning, August 28th, the dream will come true. There's going to be a colorful lunar eclipse visible from five continents including most of North America: map

<http://science.nasa.gov/headlines/y2007/images/dreamyeclipse/LE2007Aug28-Fig3.GIF>

The event begins 54 minutes past midnight PDT (0754 UT) on August 28th when the Moon enters Earth's shadow. At first, there's little change. The outskirts of Earth's shadow are as pale as the Moon itself; an onlooker might not even realize anything is happening. But as the Moon penetrates deeper, a startling metamorphosis occurs. Around 2:52 am PDT (0952 UT), the color of the Moon changes from moon dust-gray to sunset-red. This is totality, and it lasts for 90 minutes. To understand why the change occurs, close your eyes and dream yourself all the way to the Moon. Once again, you're standing on a seashore at the Sea of Tranquility. There's no water. You're surrounded by hundreds of miles of dusty, hardened lava. Overhead hangs Earth, nightside down, completely hiding the Sun behind it. The eclipse is underway.

With the Sun blocked, you might expect utter darkness, but no, the ground at your feet is aglow. Why? Look back up at Earth. The rim of the planet seems to be on fire. Around Earth's circumference you see every sunrise and sunset in the world all at once. This incredible light beams into the heart of Earth's shadow, transforming the Moon into a landscape of copper moon dust and golden hills.

Wake up! This is really going to happen, and some planning is necessary. Start times of totality are listed in the table below. Set your alarm an hour or so in advance to gather snacks and dress warmly. (Even in August, four o'clock in the morning can be chilly.) Waking up early also allows you to catch some of the partial eclipse before totality. The eclipse will be visible from Australia, Japan, parts of Asia and most of the Americas, but not from Africa or Europe. Pacific observers are favored. On the west coast of the United States, the entire eclipse will unfold high in the post-midnight sky. On the east coast, totality will be truncated by sunrise. That's okay; even a little eclipse can be a dream. [http://science.nasa.gov/headlines/y2007/03aug\\_dreamyeclipse.htm](http://science.nasa.gov/headlines/y2007/03aug_dreamyeclipse.htm)

### STRANGE LIGHTS: THE 2007 AURIGID METEOR SHOWER

Will they come, or will they not? That is the question. On Sept. 1, 2007, a flurry of bright and oddly-colored meteors might emphasize on might-come streaming out of the constellation Auriga, putting on a beautiful early morning show for sky watchers in western North America: sky map [http://science.nasa.gov/headlines/y2007images/aurigids/skymap\\_north.gif](http://science.nasa.gov/headlines/y2007images/aurigids/skymap_north.gif)

The source of the putative shower is Comet Kiess (C/1911 N1), a mysterious "long-period comet" that has visited the inner solar system only twice in the past two thousand years. In 83 BC, give or take a few centuries, Comet Kiess swung by the sun and laid down a trail of dusty debris that has been drifting toward Earth's orbit ever since. On Sept. 1, 2007, the dusty trail and Earth will meet. But will a shower actually materialize? The answer lies in the unknown contents of the debris stream. "*We have so little experience with ancient debris from long-period comets,*" notes Bill Cooke of NASA's Meteoroid Environment Office (MEO) at the Marshall Space Flight Center. "*Almost anything could happen from a fizzle to a beautiful meteor shower.*"

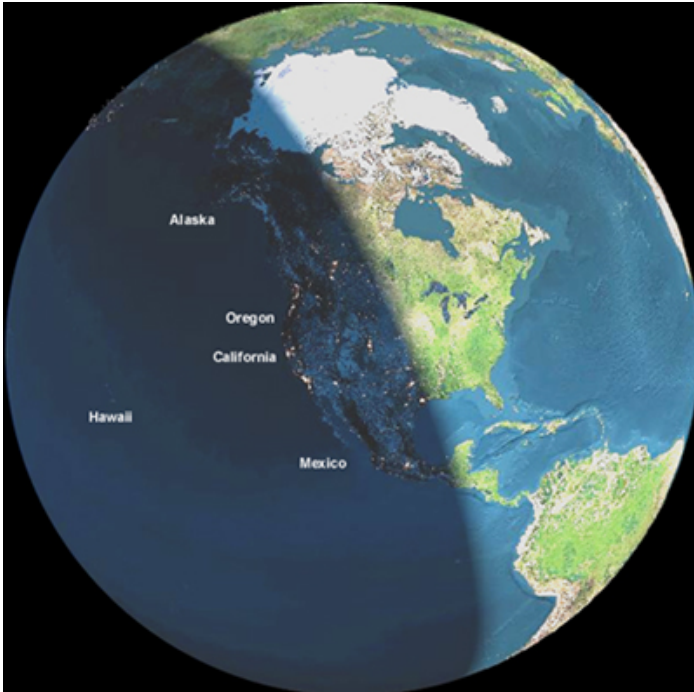
Astronomers were first alerted seven years ago to the possibility of a shower by Finnish astronomer Esko Lyytinen and Peter Jenniskens. Both are accomplished meteor forecasters who study the dynamics of cometary dust trails. Jenniskens has since teamed with Jeremie Vaubaillon to refine the forecast using a debris stream model developed by Vaubaillon.

**"We expect the outburst to peak at 11:36 UT (4:36 a.m. PDT) +/- 20 minutes on Sept. 1st," says Jenniskens. "The whole event should last about 2 hours and be visible from California, Oregon, Hawaii and the eastern Pacific Ocean."**

An independent model of the debris stream calculated by Danielle Moser, a colleague of Cooke, predicts a peak time of 11:26 UT. "That's in good agreement with Jenniskens and Vaubaillon," says Cooke. "However, our model predicts a mostly empty stream and a very weak shower." "Personally, I think the meteor rate will reach 100 per hour at best," notes Vaubaillon, "but some colleagues are more optimistic, so, suspense, suspense!!!" Earth has had at least three encounters with the debris stream in the past century - in 1935, 1986, and 1994. Unfortunately, few people were outdoors paying attention. The best observed encounter was in 1994 when veteran meteor watchers Bob Lunsford and George Zay witnessed a number of bright blue-green meteors emerging from Auriga. The brief shower was remarkable both for its conspicuous lack of faint meteors and for the vivid colors--characteristics that may be repeated on Sept. 1st.

Meteors from long-period comets are of special interest for two reasons:

#1 -- Long period comets almost always take us by surprise. They linger in the outer solar system, hiding in the dark for thousands or millions of years, until their slow orbits turn them sunward and--in they plunge! Because of this surprise factor, long period comets pose a unique impact threat. Jenniskens and others are keen to study meteor showers from long period comets because the showers could be a "tell" that a comet is out there, and the orbit of the meteoroids can reveal where.



[http://science.nasa.gov/headlines/y2007/08aug\\_aurigids.htm](http://science.nasa.gov/headlines/y2007/08aug_aurigids.htm)

#2 -- Meteors from long period comets may be very primitive. Consider the following: Most meteor showers (e.g., the Perseids and Leonids) are caused by short period comets, which pass through the inner solar system every few decades or, at most, centuries. Their icy surfaces are frequently heated and vaporized by intense sunlight, and the comet dust they produce is correspondingly fresh. Long period comets, on the other hand, are rarely sun-blasted, and their surfaces may retain ancient substances formed by billions of years of cosmic ray exposure in

the outer solar system. Flakes from this "pristine crust" may produce odd colors when they hit Earth's atmosphere. Is that why the Aurigid meteors of 1994 were blue-green? Were they bits of pristine crust from Comet Kiess? Again, no one knows. Jenniskens notes that another meteor outburst, the alpha Monocerotids of 1995, also thought to hail from an unknown long-period comet, was strange: "The alpha- Monocerotids penetrated 5 km deeper in the atmosphere than other meteors of similar size and speed and they had [an unusually] low content of sodium."

To get to the bottom of some of these mysteries, Jenniskens and colleagues will board two private jets to observe the Aurigids from the clear air of 45,000 feet. They'll use spectrometers, cameras and telescopes to measure the velocity, penetration, and chemical composition of incoming meteoroids. Bill Cooke of the MEO won't be on board, but he wishes the flyers well. "If this shower actually happens, the data they collect may tell us new things about an important population of meteoroids in the solar system. Plus, it would be a good show for people on the ground." Sept. 1, 2007: The answers await.

## WATER, WATER EVERYWHERE -- ON AN EXTRASOLAR PLANET

Scientists report the first conclusive discovery of the presence of water vapor in the atmosphere of a planet beyond our Solar System. The discovery was made by analyzing the transit of the gas giant HD 189733b across its star, in the Infrared. Giovanna Tinetti, and colleagues from around the world, used data from Spitzer Space Telescope. They targeted planet HD 189733b, 63 light-years away, in the constellation Vulpecula. The planet was discovered in 2005 as it dimmed the light of its parent star by some three percent when transiting in front of it. Using Spitzer, Tinetti and the team observed the star, which is slightly fainter than the Sun. They watched its starlight dim at two infrared bands (3.6 and 5.8 micrometers).

Had the planet been a rocky body devoid of atmosphere, both these bands and a third one (8 micrometers), recently measured by a team at Harvard, would have shown the same behavior. Instead, as the planet's tenuous outer atmosphere slipped across the face of the star, the starlight absorbed showed a different, distinctive pattern. The atmosphere absorbed less infrared radiation at 3.6 micrometers than at the other two wavelengths. "Water is the only molecule that can explain that behavior," says Tinetti. The presence of water vapor does not necessarily make it a good candidate in the search for planets that harbor life. "This is a far from habitable world," she adds. Instead of a rocky world like Earth, HD 189733b is large, about 1.15 times the mass of Jupiter. Located just 4.5 million km from its star, it orbits it in 2.2 days. In comparison, Earth is 150 million km from the Sun; even Mercury, the innermost planet, is 70 million km away. Astronomers classify such worlds as 'hot Jupiters'. These planets tend to have extensive atmospheres because heat from the nearby star gives them energy to expand. HD 189733b is no exception; its diameter is 1.25 times that of Jupiter.

HD 189733b's atmospheric temperature is about 1000 Kelvin (a little more than 700 C) or higher, implying that the significant amounts of water vapor in the atmosphere cannot condense to fall as rain or form clouds. The temperature would have to be about five times lower to form clouds of water vapor or rain. That does not mean the atmosphere is sedate, however. The planet is gripped so tightly by the gravity of its star that one hemisphere constantly faces the star, heating the planet only on one side. This probably generates fierce winds sweeping from the day-side to the night-side. "There are a thousand things to learn about these planets," says Tinetti. Although, being a gas giant, the planet is an unlikely candidate in the search for life, these results

increase hopes for the detection of water on other rocky planets, which astronomers hope to discover in the near future. France's COROT mission, is expected to detect dozens of transiting gas giants, and has been working so well that it may also detect nearly Earth-sized worlds. Atmospheres of rocky planets should be much more tenuous, so they will have to wait for future space telescopes, such as the James Webb Space Telescope, before they can be investigated.

### COMPUTER PROGRAM MAKES NIGHT SKY SEARCHABLE

Computer science PhD candidate Dustin Lang has embarked on his own Star Trek as part of <http://astrometry.net/>

Under the tagline 'Making the Sky Searchable', Lang and fellow graduate student Keir Mierle have put together a system that takes an image of the night sky and figures out which stars the image contains. The goal of the project, a concept originated by Lang's supervisor, Professor Sam Roweis, is to apply cutting-edge machine learning and computer vision ideas to huge astronomical data sets. The technology will assist amateurs, as well as professionals

"We call it a blind astrometry solver," Lang explained. "It's a bit like going outside on a dark night and trying to find the constellations, except we're trying to recognize images that come from all kinds of cameras, amateur telescopes, large ground-based telescopes and space telescopes such as the Hubble Space Telescope. Some of the images we are trying to solve cover less than a millionth of the area of the sky -- about 10 per cent of the size of the full moon."

When asked what he enjoys most about the project, Lang said, "Working with astronomers is great. They deal with extremely small and extremely large things, so they get to be really good at "order-of-magnitude" thinking: Is this process going to take a minute, an hour or a week? Do we need 10, 100 or 1,000 computers to solve this problem?" On the technical side, because the group is processing information about a billion stars, Lang noted, "We have to ensure that everything we do is done efficiently ... the project requires a lot of tricky technical engineering, which I find fun." He added, "And, of course, I get to look at a lot of beautiful pictures of the sky."

Astrometry.net has significant implications for both professional and amateur astronomers, since, said Lang, "Amateur astronomers can take great pictures but they rarely record where their telescopes are pointing -- we can figure out exactly where the image came from and combine images into a high-resolution picture of the sky that is always being updated. Professional astronomers can use this data to look for transient events like comets, supernovae -- things an amateur astronomer may have taken a picture of without even knowing it."

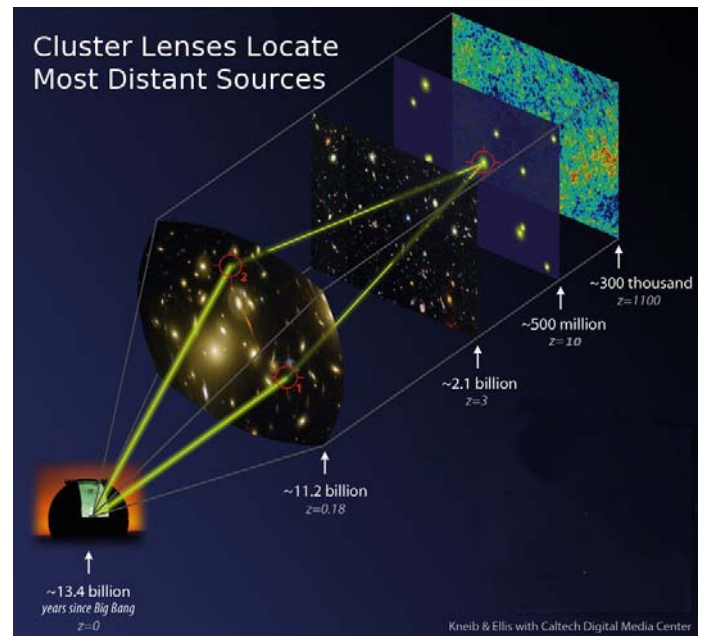
What's more, Lang explained, "observatories around the world have large archives of photographic plates, some going back to the early 1800s. These collections are being scanned to make them available digitally; if astronomers could easily tap into these images, they would have a much longer history to look for changes over time." This project is also helpful in correcting possible telescope errors; the system can check to make sure information recorded by telescopes is correct and recover images where the telescope information was wrong.

Current plans for the project include making the system more robust, flexible and fast, creating a way of incorporating new images to make a map of the sky that is updated and improved as people add new images to it. There are groups interested in hooking the system up to new telescopes that are being built and

other astronomers hoping to use it in their own research. Lang is enthusiastic about these possibilities and is pleased that while the project is "geared towards professional astronomers, we'll end up producing a system that should be of interest to amateur astronomers -- and anyone who has looked up at the sky and wondered ... ."

### ASTRONOMERS FIND THE MOST DISTANT KNOWN GALAXIES

Using natural "gravitational lenses," an international team of astronomers led by Richard Ellis claim to have found the first traces of a population of the most distant galaxies yet seen -- the light we see from them today left more than 13 billion years ago, when the universe was just 500 million years old. When light from very distant bodies passes through the gravitational field of much nearer massive objects, it bends in an effect known as "gravitational lensing." In a pioneering technique, the group used massive clusters of galaxies -- the best example of natural gravitational lenses -- in a series of campaigns to locate progressively more distant systems that would not be detected in normal surveys. The team found the galaxies using the 10-meter Keck II telescope, sited atop Mauna Kea on the Big Island of Hawaii.



Ellis explains, "Gravitational lensing is the magnification of distant sources by foreground structures. By looking through carefully selected clusters, we have located six star-forming galaxies seen at unprecedented distances, corresponding to a time when the universe was only 500 million years old, or less than four percent of its present age." It is thought that when the universe was 300,000 years old it entered a period when no stars were shining. Cosmologists refer to this phase of cosmic history as the "Dark Ages." Pinpointing the moment of "cosmic dawn" when the first stars and galaxies began to shine and the Dark Ages ended is a major observational quest and provides the motivation for building future powerful telescopes such as the Caltech's Thirty Meter Telescope, and the space-borne James Webb Telescope.

The new survey is the culmination of three years' painstaking observations which represent the thesis of Caltech graduate student Dan Stark. "Using Keck II, we have detected six faint star-forming galaxies whose signal has been boosted about 20 times by the magnifying effect of a foreground cluster. That we should find so many distant galaxies in our small survey area suggests

they are very numerous indeed. We estimate the combined radiation output of this population could be sufficient to break apart (ionize) the hydrogen atoms in space at that time, thereby ending the Dark Ages," said Stark.

Proving definitively that each of the six objects is unambiguously at these enormous distances (and hence being viewed at such early times) is hard, even with the most powerful instruments. "As with all work at the frontiers, skeptics may wish to see further proof that the objects we are detecting with Keck are really so distant," confessed Ellis. However, in addition to numerous checks the team has made (described in their published scientific article) following their initial discovery a year ago, Ellis and Stark point to supporting evidence from galaxies containing old stars that are seen when the universe was just a bit older.

"We can infer the universe had a lot of star formation at these early times from Spitzer Space Telescope measurements of larger galaxies seen when the universe was about 300 to 500 million years older," explains Stark. "These galaxies show the tell-tale sign of old stars (and were described in earlier work by Ellis and Stark with UK scientist Andrew Bunker). To produce these old stars requires significant earlier activity, most likely in the fainter star-forming galaxies we have now seen."

Also associated with the program is Caltech postdoctoral scholar Johan Richard, who is leading a similar, but independent, survey of magnified galaxies detected with the Hubble and Spitzer space telescopes. Although that work is not yet complete, preliminary findings support the conclusions of the Keck II survey. [http://www.astro.caltech.edu/~johan/cosmic\\_dawn/](http://www.astro.caltech.edu/~johan/cosmic_dawn/)

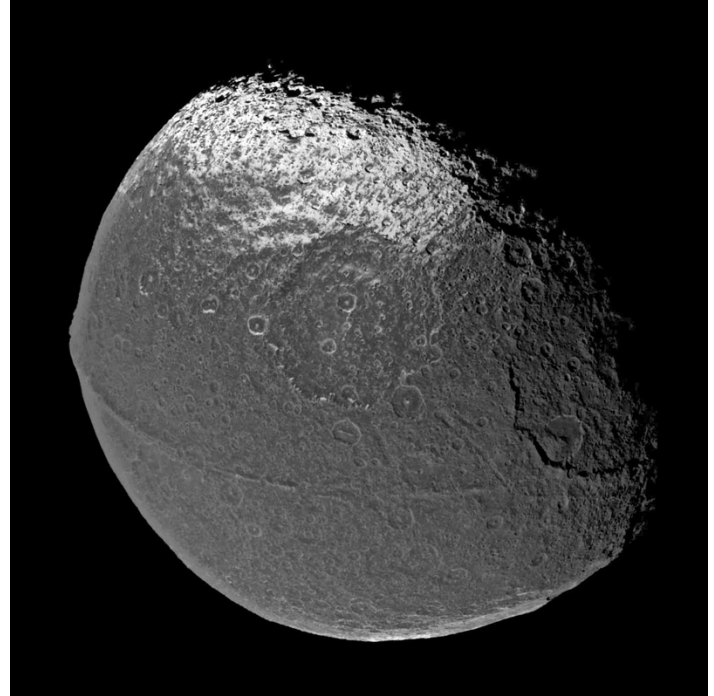
#### SATURN'S OLD MOON IAPETUS RETAINS ITS YOUTHFUL FIGURE

Saturn's distinctive moon Iapetus (eye-APP-eh-tuss) is cryogenically frozen in the equivalent of its teenage years. The moon has retained the youthful figure and bulging waistline it sported more than three billion years ago, scientists report. "Iapetus spun fast, froze young, and left behind a body with lasting curves," said Julie Castillo, Cassini scientist.

Unlike any other moon in the solar system, Iapetus is the same shape today as it was when it was just a few hundred million years old; a well-preserved relic from the time when the solar system was young. These results appear in the online version of the journal *Icarus*. Cassini flew by Iapetus in early 2005 and discovered the moon had a walnut shape, bulging at its midsection. On top of that it has a chain of mountains located exactly along its equator. Scientists now think the moon's bulging midriff and slow spin rate point to heating from long-extinct radioactive elements present when the solar system was born.

"We've modeled how Iapetus formed its big, spin-generated bulge and why its rotation slowed down to its present nearly 80-day period. As an unexpected bonus, Iapetus also told us how old it was," said Dennis Matson, Cassini project scientist at JPL. "You would expect a very fast-spinning moon to have this bulge, but not a slow-spinning moon, because the bulge would have been much flatter." Scientists calculate Iapetus originally rotated much faster—at least five hours, but less than 16 hours per revolution. The fast spin gave the moon an oblate shape that increased the surface area (in the same way the surface area of a round balloon stretches when the balloon is pressed into an oblate shape). By the time the rotation slowed down to a period of 16 hours, the outer shell of the moon had frozen. Furthermore, the surface area of the cold moon was now smaller. The excess surface material was too rigid to go back smoothly into the moon. Instead, it piled up in a chain of mountains at the equator.

"Iapetus' development literally stopped in its tracks," said Castillo. "In order for tidal forces to slow Iapetus to its current spin rate, its interior had to be much warmer, close to the melting point for water ice." The challenge in developing a model of how Iapetus came to be "frozen in time" has been in deducing how it ever became warm enough to form a bulge in the first place, and figuring out what caused the heat source to turn off, leaving Iapetus to freeze.



The heat source had to have a limited life span, to allow the moon's crust to rapidly become cold and retain its immature shape. After looking at several models, scientists concluded that the heat came from its rocks, which contain short-lived radioactive isotopes aluminum-26 and iron-60 (which decay very rapidly on a geologic timescale). Since these elements decay at a known rate, this allowed scientists to "carbon date" Iapetus by using aluminum-26 instead of carbon. Scientists calculate the age of Iapetus to be roughly 4.564 billion years old. Evidence for these same isotopes (aluminum-26 and iron-60) has been found in meteorites formed in the inner solar system. Therefore, there is a possibility of comparing the early chronology of the outer solar system with other objects in the inner solar system, such as Earth, Earth's moon and asteroids. "This is the first direct evidence of the early spin history for a satellite in the outer solar system. It teaches us more about how the speed of a body's rotation influenced its evolution, and broadens our knowledge of the early history of outer planet satellites," said Matson. Cassini's next close encounter with Iapetus will occur on Sept. 10, 2007, at 1,000 kilometers (620 miles) from the surface. <http://www.jpl.nasa.gov/news/news.cfm?release=2007-079>

#### RESEARCHERS PRODUCE IMAGES OF GASES ESCAPING JUPITER'S MOON IO

Researchers have published the first clear evidence of how gases from Jupiter's tiny moon's volcanoes can lead to the largest visible gas cloud in the solar system. Jupiter, the largest planet in the solar system, has a moon named Io that is just 100 km larger in radius than Earth's Moon. According to lead researcher Michael Mendillo, professor of electrical and computer engineering and astronomy, there are over 100 active volcanic sites on Io making

it the most active place for volcanic activity known anywhere. "Of the various gases that come from Io's volcanoes, sodium atoms can be detected using ground-based telescopes because the light they emit is in the visible part of the spectrum -- the same familiar orange glow from sodium street lights that are in most American cities," said Mendillo. "Therefore, sodium atoms become a tracer of other elements that might be more abundant, but less easy to see."

In 1990, BU scientists discovered a large gas cloud -- or nebula -- of sodium atoms (Na) spanning great distances to either side of Jupiter. "If this faint structure could be seen by the naked eye, it would be over ten times the size of the full Moon, and thus the largest permanently visible object in our solar system," Mendillo explained. "Computer models suggested the types of escape processes needed to feed this giant nebula, but actual pictures of those sources eluded observers for many years."

The research team solved this problem by developing a novel way to photograph these sources using a high-definition imaging (HDI) system that combines several images into one clear picture. The new images reveal two distinct sources of sodium atoms escaping from Io. One is a symmetrical cloud of escaping gas produced by collisions of the streaming ions and electrons in Jupiter's so-called plasma torus. These plasma particles are trapped in Jupiter's strong magnetic field and rotate with the planet's 10-hour period, much faster than the 2-day orbital period of Io. "So, there is a continuous plasma wind hitting Io, causing sodium atoms to be sputtered from its atmosphere," Mendillo explained.

According to the scientists, this sputtering source is distinctly different from a localized source of atoms produced chemically in the wake of the streaming torus flow past Io. The images define the extent of the sputtering and stream sources for the first time. "Since the giant sodium nebula that they create varies over periods of months to years, the source of the variability is probably not the symmetrical sputtering cloud, but the streaming-wake source that waxes and wanes with volcanic activity on Io," explained Jody Wilson, CSP senior research associate and a study co-author.

The observations were made using a 4-meter telescope operated by the U.S. Air Force at Haleakala on Maui, HI. To capture the faint signals from sodium atoms close to Io, the observers had to find a way to cope with the bright sunlight reflected from Io's surface, as well as from the even stronger light from nearby Jupiter. In addition, ever-present turbulence in the Earth's atmosphere causes the image of Io to jitter about randomly. Thus, any attempt to capture the faint Na light by long time-exposures would result in a highly blurred image. "Our HDI system solved this problem in two ways. First, by taking very short exposures -- 1/60th of a second -- the atmosphere might be steady for that instant and thus occasional sharp images could be found; and second, by dividing the full spectrum of light from Io into a narrow wavelength range," explained CSP senior research associate Jeffrey Baumgardner, the HDI instrument designer and a co-author of the study. "That is, capturing only the color needed to see sodium above the glare of full light and then using most of the remaining light to simultaneously follow the fluctuating positions of Io." The goal was to then reposition Io to the same place in each frame and use only the very clearest of those frames to make what Mendillo calls "the ideal time exposure, one made with the target stationary, a good spectral signal, and the best possible seeing."

The CSP observing team returned to Boston with 62,500 such images stored on a computer and Mendillo wondering how the goal would be achieved. Study co-author Sophie Laurent

assumed responsibility for the required signal processing, with guidance from Professors Clem Karl and Janusz Konrad, signal processing experts. Dr. Laurent devised automated ways to center all of the images and then to find the highly-defined ones needed to make the best possible images. "These images provide specific spatial scales and relative strengths of these sources that now can be put into computer models that attempt to simulate how all types of gases escape from Io to populate the vast regions of space surrounding Jupiter," Mendillo added

## **BOTH MARS EXPLORATION ROVERS RESUME DRIVING**

After six weeks of hunkering down during raging dust storms that limited solar power, both of the Mars Exploration Rovers, Spirit and Opportunity, have resumed driving. Opportunity advanced 13.38 meters (44 feet) toward the edge of Victoria Crater on Aug. 21. Mission controllers were taking advantage of gradual clearing of dust from the sky while also taking precautions against buildup of dust settling onto the rover. "Weather and power conditions continue to improve, although very slowly for both rovers," said John Callas, project manager for the rovers. With the improved energy supplies, both rovers are back on schedule to communicate daily. Opportunity had previously been conserving energy by going three or four days between communications.

No new storms have been lifting dust into the air near either solar-powered rover in the past two weeks. Skies are gradually brightening above both Spirit and Opportunity. "The clearing could take months," said rover Project Scientist Bruce Banerdt. "There is a lot of very fine material suspended high in the atmosphere."

As that material does settle out of the air, the powdery dust is accumulating on surfaces such as the rovers' solar panels and instruments. More dust on the solar panels lessens the panels' capacity for converting sunlight to electricity, even while more sunlight is getting through the clearer atmosphere.

Opportunity's daily supply of electricity from its solar panels reached nearly 300 watt-hours on Aug. 23. That is more than twice as much as five weeks ago, but still less than half as much as two months ago. It is enough to run a 100-watt bulb for three hours.

One reason the rover team chose to drive Opportunity closer to the crater rim was to be prepared, if the pace of dust accumulation on the solar panels increases, to drive onto the inner slope of the crater. This would give the rover a sun-facing tilt to maximize daily energy supplies. The drive was also designed to check performance of the rover's mobility system, so it included a turn in place and a short drive backwards.

The next day, a favorable wind removed some dust from Opportunity's solar panels, providing a boost of about 10 percent in electric output. This forestalled the need to hurry to a sun-facing slope. The team is still excited to get Opportunity inside Victoria Crater to examine science targets on the inner slope that were identified in June, shortly before dust storms curtailed rover activities. An estimate of how soon Opportunity will enter the crater will depend on assessments in coming days of how dust may be affecting the instruments and of how much energy will be available.

On Spirit, dust on the lens of the microscopic imager has slightly reduced image quality for that instrument, although image calibration can compensate for most of the contamination effects. The team is experimenting with ways to try dislodging the dust on the lens. Spirit's solar arrays are producing about 300 watt hours per day as dust accumulation on them offsets clearing skies. Spirit drove 42 centimeters (17 inches) backwards on Aug. 23 to

get in position for taking images of a rock that it had examined with its Moessbauer spectrometer. The rover team is planning additional drives for Spirit to climb onto a platform informally named "Home Plate."  
<http://www.jpl.nasa.gov/news/news.cfm?release=2007-093b>

### HURTLING TOWARD MARS

August 21, 2007: By the time you finish reading this sentence, you'll be 25 miles closer to the planet Mars. Earth and Mars are converging, and right now the distance between the two planets is shrinking at a rate of 22,000 mph--or about 25 miles per sentence. Ultimately, this will lead to a close approach in late December 2007 when Mars will outshine every star in the night sky. Of a similar encounter in the 19th century, astronomer Percival Lowell wrote the following: "*[Mars] blazes forth against the dark background of space with a splendor that outshines Sirius and rivals the giant Jupiter himself.*"

Contrary to rumor, though, Mars is never going to outshine the Moon. There is an email circulating the internet - called the "Mars Hoax" or the "Two Moons email" - claiming that Mars will soon swell as large as the full Moon, and the two will hang together side by side on the night of Aug. 27th. "Mars will be spectacular," it states. "No one alive today will ever see this again." No one will see it, because it won't happen. It is true that Earth and Mars are converging--you're now 300 miles closer--but even at closest approach the two planets are separated by a gulf of tens of millions of miles. From such a distance, Mars looks like a star, an intense yet tiny pinprick of light, never a full Moon.

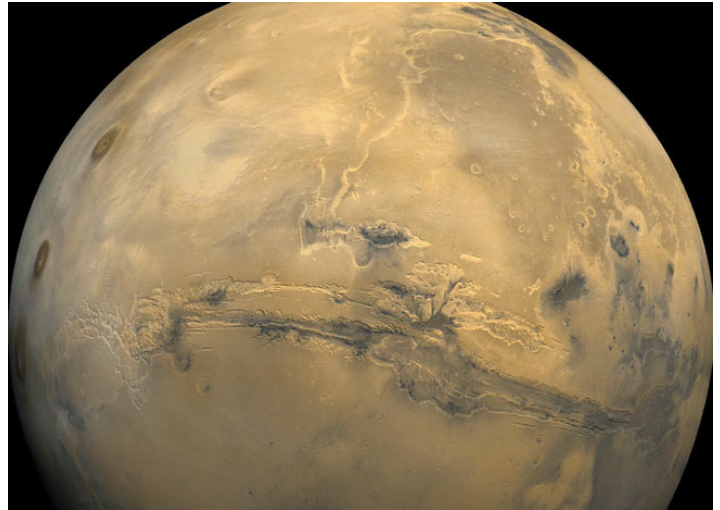
To appreciate the situation, think of Earth and Mars as runners on a track, with speedy Earth on the inside lane and slower Mars on the outside:  
<http://science.nasa.gov/headlines/y2007/images/hurlingtomars/geometry.jpg> diagram  
 Now, in August, Earth is catching up to Mars from behind. Relative speed: 22,000 mph. In December, Earth overtakes Mars, still moving rapidly but never approaching the Red Planet any nearer than the gap between lanes: about 55 million miles.

Mindful that the two planets are converging, NASA chose this time to send its Phoenix Lander to Mars. Launched on Aug. 4, 2007, from Cape Canaveral, Phoenix is slated to land in late May 2008 on a Martian arctic plain where Phoenix's robotic arm will dig in the dirt hunting for, among other things, habitats for microbial life. Only to Phoenix, when it gets very close to Mars next year, will the red planet actually rival the Moon in apparent size.

So...you should forget about Mars on August 27th, right? Not so fast. While there won't be Two Moons on August 27th, there will be Two Eyes. At 3 o'clock in the morning on that date, Mars will rise in the eastern sky alongside the red giant star Aldebaran. The two red lights side-by-side will resemble two eerie, unblinking eyes. This is worth waking up for!

If you've been following the adventures of Spirit and Opportunity, you know that Mars is currently experiencing a planet-wide dust storm. Rust-colored dust is choking the air and dimming sunlight, causing problems for the two solar-powered rovers. During the past month, they've had to "stand-down" - no roving or digging or even communicating with Earth at times - in order to conserve power. A backyard telescope pointed at Mars on August 27th may reveal vast clouds of dust partially eclipsing some of the planet's familiar surface markings. Or it may reveal a totally orange ball -

that's what Mars looks like when the dust storm kicks into high gear. Take a look; every night the view improves. You're now 1000 miles closer to the planet Mars.  
[http://science.nasa.gov/headlines/y2007/21aug\\_hurlingtomars.htm](http://science.nasa.gov/headlines/y2007/21aug_hurlingtomars.htm)



### 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 August's StarGazer:**

- \*\*\*\* **ASTRO CALENDAR – STAR PARTY SCHEDULE – WESTERN US 2007 STAR PARTIES**
- \*\*\*\* **OBSERVER'S INFORMATION**
- \*\*\*\* **YOUNG ASTRONOMER'S CORNER**
- \*\*\*\* **ASTRONOMY AND TELESCOPE LINGO**
- \*\*\*\* **CONSTELLATION OF THE MONTH**
- \*\*\*\* **MIRROR IMAGES**
- \*\*\*\* **CONSTELLATIONS OF THE MONTH (LACERTA, SAGITTA, AQUARIUS)**
- \*\*\*\* **SPITZER FINDS EVIDENCE FOR PLANETS WITH FOUR PARENTS**
- \*\*\*\* **COMET MAY HAVE EXPLODED OVER NORTH AMERICA 13,000 YEARS AGO**
- \*\*\*\* **DIGITAL ARCHIVE CASTS NEW LIGHT ON APOLLO-ERA MOON PICTURES**
- \*\*\*\* **DREAMY LUNAR ECLIPSE**
- \*\*\*\* **STRANGE LIGHTS: THE 2007 AURIGID METEOR SHOWER**
- \*\*\*\* **WATER, WATER EVERYWHERE -- ON AN EXTRASOLAR PLANET**
- \*\*\*\* **COMPUTER PROGRAM MAKES NIGHT SKY SEARCHABLE**
- \*\*\*\* **ASTRONOMERS CLAIM TO FIND THE MOST DISTANT KNOWN GALAXIES**
- \*\*\*\* **SATURN'S OLD MOON IAPETUS RETAINS ITS YOUTHFUL FIGURE**
- \*\*\*\* **RESEARCHERS PRODUCE IMAGES OF GASES ESCAPING JUPITER'S MOON IO**

**The next EAS Meeting is 3:00 P.M. Saturday August 25<sup>th</sup> at the Everett Public Library Auditorium.**