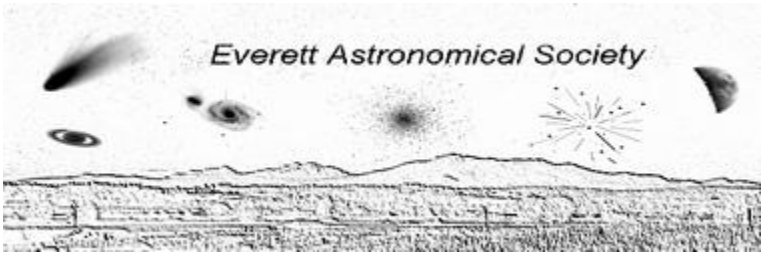
Volume MMVIV. No. 2



The Stargazer

February 2009

President: Mark Folkerts	(425) 486-9733	folkerts at seanet.com	***The Stargazer***
Vice President: James Bielaga	(425) 337-4384	jamesbielaga at aol.com	**P.O. Box 12746**
Librarian: Mike Locke	(425) 259-5995	lockemi at comcast.net	**Everett, WA 98206**
Treasurer: Carol Gore	(360) 856-5135	janeway7C at aol.com	
Newsletter co-editor: Bill O'Neil	(774) 253-0747	wonastrn at netway.com	
Web assistance: Cody Gibson	(425) 348-1608	sircody01 at comcast.net	*See EAS website at:*
		(change 'at' to @ to send email)	http://everettastro.org

EAS BUSINESS…

NEXT EAS MEETING – FEBRUARY 28TH 7 PM AT AURORA ASTRO PRODUCTS STORE AT SILVER LAKE.

★★ Saturday February 28th 7:00 pm MEETING ★★

This month's program features Denis G. Janky, from SAS, who will present a great multi-media presentation on Spring Galaxies, with sky maps, images, and descriptions of the best galaxy objects to observe in the spring sky over the next two months.

Cascade High School - Solar System Scale Model Project

Cascade High School has an astronomy club of 9th graders who are thinking of doing a solar system model in Everett, are deciding how to go about it, and are checking if the astronomy club might be interested in helping them out. They may come to our next meeting (Feb 28th) and talk about what they are doing.

They are thinking of doing the scale model with it starting at Cascade High, and maybe going out to Silver Lake, or starting at Silver Lake by Emory's, and going through town. They want the model where people can walk along it. Jim also suggested either Silver Lake, or maybe they could make it go from Broadway and Hewitt corner by Everett Events center, and head west towards the water or end at the Library. Bring your ideas about how the EAS could help them accomplish this project.

Map/Directions to Aurora Astro Products store location - http://www.skyvalleyscopes.com/aurora_astro_products_silver_lak.htm

Silver Lake Plaza, 11419 19th AVE. SE, Everett, WA 98208

If you are traveling northbound on I-5:

Take exit #186/128th St. and go east - to the right on 128th St. continue until you come to Murphy's Corner/Intersection with Highway 527/19th Ave SE/Old Bothell-Everett Highway (all one in the same) and turn left/north. Follow until you see Silver Lake Plaza (red brick construction) on your right with the lake is on your left.

If you are traveling southbound on I-5:

*Take exit 187/Everett Mall Way and at the top of the exit's hill turn right following signs for Highway 527. At the light turn right following the signs for Highway 527. Then stay on Highway 527/19th Ave SE/Old Bothell-Everett Highway until you have Silver Lake on your right and the Silver Lake Plaza on your left. You may also continue down I-5 until exit 186 and turn left onto 128th then follow previous directions. If you have a problem you **can** always call (425) 337-4384*

The March Meeting will be March 28th.

* ASTRONOMY SWAP MEET AT AURORA ASTRO *

Free Astronomy Swap Meet – Sunday Mar 29th 10:00 – 4:00

"Clean out the garage get rid of that eyepiece you never use and turn it into cash, or trade it for that other guys treasure, or use your new found wealth to snag that new Ethos eyepiece you always wanted ! Besides swap meet, there will be BBQ with Astro Hot Dogs, drinks, solar viewing, and raffle of Meade 8.8mm UWA eyepiece, a $199 value. I will provide some tables for swap meet and folding chairs. Please email or call if you are going to trade and if you can bring a solar telescope let me know ahead of time.

- *See you there."*

Jim Bielaga-owner
Aurora Astro Products
11419 19th Avenue SE #A102 in Silver Lake Plaza
Everett, WA 98208
425-337-4384
Email infoauroraastro@aol.com

★ STAR PARTY INFO ★

Scheduled EAS Star Parties at Ron Tam's:

Apr 18 (Sat. last Qtr Moon) or Apr 25 (Sat).
May 23 (Sat. Memorial Day weekend)
Jun 20 (Sat.)
Jul 18 (Sat.)
Aug 22 (Sat)
Sep 19 (Sat)
Oct 17 (Sat)
Nov 14 (Sat)

CAMP DELANEY SPRING STAR PARTY:

"The Olympic Astronomical Society will be hosting its 6th annual spring Camp Delany star party at Sun Lakes State Park April 23 - 26, 2009. We have enjoyed having your members join us in the past and I am extending a welcome again this year. The sign up form will be available on our website soon and can be found at www.olympicastronomicalsociety.com. I hope this note finds your

respective clubs doing well. We are very excited about The year of Astronomy as I am sure you are as well."

- Cliff Mygatt, President, Olympic Astronomical Society

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 send mail to the mail list ***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

MARCH -

Mar 20-21 2009 - RCA 2009 Messier Marathon Star Party, Kah-Nee-Ta Resort and Casino, Warm Springs, OR - http://www.rca-omsi.org/sp/kahneeta.htm

Mar 21 2009 - OMSI-RCA Vernal Equinox Star Party, Rooster Rock State Park & Stub Stewart State Park, OR http://www.rca-omsi.org/sp/sp_schedule.htm

Mar 28 2009 - OAS Messier Marathon Star Party, http://www.olympicastronomicalsociety.com/ *

APRIL -

Apr 18 2009 - OMSI-RCA Planet Parade Star Party, Rooster Rock State Park & Stub Stewart State Park, OR http://www.rca-omsi.org/sp/sp_schedule.htm

Apr 19-26 2009- Texas Star Party (TSP) 2009, Prude Ranch, Fort Davis, TX - http://www.texasstarparty.org/

Apr 23-26 2009 - OAS Camp Delany Star Party, Sun Lakes SP - http://www.olympicastronomicalsociety.com/Documents/CAMPDELANY_Spring_2009_Sign-UpForm-new.pdf

MAY -

May 2 2009 - OMSI-RCA Astronomy Day Star Party, Rooster Rock State Park & Stub Stewart State Park, OR http://www.rca-omsi.org/sp/sp_schedule.htm

May 16 2009 - RCA Prineville Reservoir Star Party, Prineville, OR - http://www.rca-omsi.org/sp/sp_schedule.htm

May 22-24 2009 - RCA Maupin Dark Sky Star Party, Maupin, OR - http://www.rca-omsi.org/sp/maupin.htm

May 22-25 2009 (Memorial Day) - Annual RTMC Astronomy Expo 2009, Riverside, CA **-** http://www.rtmcastronomyexpo.org/

May 23-25 2009 - Fire in the Sky – Rocket Launch & Star Party, Mansfield, WA - http://www.fireinthesky.org/ Tacoma Astronomical Society http://www.tas-online.org/calendar.php

JUNE -

Jun 13 2009 - OMSI-RCA Summer Solstice Star Party, Rooster Rock State Park & Stub Stewart State Park, OR http://www.rca-omsi.org/sp/sp_schedule.htm

Jun 13-20 2009 Grand Canyon Star Party (GCSP), On South Rim - http://www.tucsonastronomy.org/gcsp.html

Jun 17-21 2009 - The Rocky Mountain Star Stare (RMSS) 2009, Pike Nat Forest, Colorado Springs, CO http://www.rmss.org/

Jun 17-20 - Bryce Canyon Astronomy Festival, Bryce Canyon Nat. Pk, UT http://www.nps.gov/brca/planyourvisit/astronomyprograms.htm

Jun 18-21 2009 - Goldendale 2009 NWRAL "First Light", Skyview Acres - Goldendale WA http://klickitatstarparty.net/

Jun 19-21 2009 - RCA Maupin Dark Sky Star Party, Maupin, OR - http://www.rca-omsi.org/sp/maupin.htm

Jun 19-20, Jul 24-25, Aug 21-22 2009 - Stars Over Yellowstone Star Parties, Madison Campground Amphitheater, http://smasweb.org/

Jun 20-24 2009 - Golden State Star Party 2009, Frosty Acres Ranch, Adin, CA http://goldenstatestarparty.blogspot.com/

Jun 19-20 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/

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-omsi.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-omsi.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

AUGUST -

Aug 11 2009 - OMSI-RCA Perseid Meteor Shower Star Party, Rooster Rock State Park & Stub Stewart State Park, OR http://www.rca-omsi.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 12 2009 - OMSI-RCA Autumnal Equinox Star Party, Rooster Rock State Park & Stub Stewart State Park, OR http://www.rca-omsi.org/sp/sp_schedule.htm

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

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 Jun) **- Shingletown Star Party,** Shingletown, Mt. Shasta, CA http://www.shingletownstarparty.org/

(tbd Aug) - **Deception Pass Star Party 2009,** Bowman Bay, Deception Pass, WA - http://squakmountain.org/deception_pass_star_party.htm http://squakmountain.org/events.html#upcoming

(tbd Sep) - **Orion Nebula 2009 Star Party,** Table Mt. (Ellensburg) WA http://www.seattleastro.org/orionnebsp.shtml

(tbd Sep) - **White Sands Star Party**, Alamogordo/White Sands, NM http://www.zianet.com/wssp/

(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

Publicity / Astronomy-Day coordinator: (**David Brodeur**) – Make reservations for venue (library), notify websites about EAS astronomy day events, create press releases and notify news organizations about EAS events, and promote new membership

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…

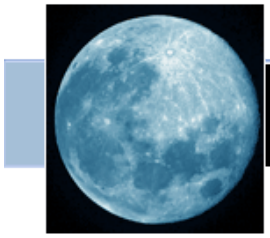
Attention EAS Members – 10% Discount for all Everett Astronomical Society Members at Aurora Astro Products

"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"

>> 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 Products
"*Your Northern Light in the Astronomy Business*"
Over 37 product dealerships, and growing

11419 19th Avenue SE #A102
Everett, WA 98208
www.auroraastro.com
425-337-4384
425-337-4758 fax

New hours:
Monday, Thursday, Friday – 9:00 am to 6:00 pm
Tuesday/Wednesday – Noon to 8:00 pm
Saturday – 10:00 am to 5:00 pm

Also, 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.

$$ - Financial Health - $$

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

Club Scopes

Scope	Loan Status
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 at aol.com to borrow a scope.

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. NRWAL would like a brief history of the club

- Club established date (approx 1986 ?)
- Who started the club (Terry Bacon, et. al.)
- When club joined the Astronomical League.

Astro Calendar for 2008-2009

February 2009

Feb 09 - Penumbral Lunar Eclipse
Feb 17 - 50th Anniversary (1959), Vanguard 2 Launch
Feb 28 - 50th Anniversary (1959), Discoverer 1 Launch
Feb 28 - EAS Meeting - 7:00 PM - Aurora Astro Products store

March 2009

Mar 08 - Daylight Saving - Set Clock Ahead 1 Hour (United States)
Mar 08 - Saturn At Opposition
Mar 20 - Vernal Equinox, 11:44 UT
Mar 28 – EAS Meeting - 7:00 PM - Aurora Astro Products store

April 2009

Apr 02 - 50th Anniversary (1959), Selection Of Mercury 7Astronauts
Apr 12 - Easter Sunday
Apr 22 - Lyrids Meteor Shower Peak
Apr 23-26 - Camp Delany star party at Sun Lakes State Park
Apr 29-May 03 - Astronomy Week

May 2009

May 02 - Astronomy Day
May 05 - Eta Aquarids Meteor Shower Peak

June 2009

Jun 05 - Venus At Its Greatest Western Elongation (46 Degrees)
Jun 21 - Summer Solstice, 05:45 UTC
Jun 23 - Pluto At Opposition

July 2009

Jul 04 - Earth At Aphelion (1.017 AU From Sun)
Jul 07 - Penumbral Lunar Eclipse
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 24 - Mercury At Its Greatest Eastern Elongation (27 Degrees)
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 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 21 - Orionids Meteor Shower Peak

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

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 five-minute segment is broadcast **every Wednesday morning at approximately 8:20 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.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.

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 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, 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://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.

OBSERVER'S INFORMATION…

LUNAR FACTS

Feb 16	Last Quarter Moon
Feb 24	New Moon
Mar 04	First Quarter Moon
Mar 11	Full Moon
Mar 18	Last Quarter Moon
Mar 26	New Moon
Apr 02	First Quarter Moon
Apr 09	Full Moon
Apr 17	Last Quarter Moon
Apr 25	New Moon
May 01	First Quarter Moon
May 09	Full Moon

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

Object	*Rises*	*Sets*	*Con*	*Diam.*	*Mag*
Sun	***06:47 am***	***17:49***	***Aqr***	***30'***	***-27.5***
Mercury	**06:12 am**	**15:34**	**Cap**	**06"**	**-0.1**
Venus	**07:39 am**	**21:29**	**Psc**	**43"**	**-4.6**
Mars	06:18 am	15:49	Cap	04"	+1.2
Jupiter	06:03 am	15:26	Cap	33"	-2.0
Saturn	**18:18**	**07:42 am**	**Leo**	**20"**	**+0.6**
Uranus	**07:32 am**	**19:02**	**Aqr**	**03"**	**+5.9**
Neptune	**06:33 am**	**16:34**	**Cap**	**02"**	**+8.0**
Pluto	**03:18 am**	**12:40**	**Sag**	**--**	**+14.0**

(times listed are in local time for Everett PST)

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

Observing Jupiter's Moons – Java tool

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

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

YOUNG ASTRONOMER'S CORNER

QUESTION: What Happens to our Sun After the "Pulsating Variable" Stage of its Life?

ANSWER: What happens next depends on the star's mass. After the pulsating variable stage, most stars develop a core (center) composed of the element carbon. Smaller stars, like our Sun, and those up to about 1.4 times the mass of the sun, will essentially die a quiet death. Others more massive end with a violent explosion called a supernova. But will the sun's eventual death really be that "quiet"? Of course, we won't be here to observe it, but perhaps other souls from a distant planet (perhaps one that humans had long since colonized) might see the sun's next step in this process. When the sun has depleted all of its available helium, it will become a red giant for the last time.

Then the sun will throw off some of its mass, in the form of its outermost hydrogen "envelope" (so to speak), out flying off into space, in a stream of electrically charged particles called the stellar wind. More deep layers of the sun will be thrown off in an expanding shell of gas called a planetary nebula. A planetary nebula is typically about one-half to one light year across. It continues to expand at about 20-30 kilometers per second (up to almost 68,000 miles per hour!!), leaving the core star far behind. A planetary nebula is a form of emission nebula, because as the gas shell expands, it is also being ionized (tremendously heated, essentially) by the hot star it left behind, and this causes some gas atoms to be disrupted and to glow and be visible.

Planetary nebulae have nothing to do with planets; they were called this because early discoverers saw that they resembled planetary discs, rather than point-like stars. About 1,000 planetary nebula have been recorded, and are generally less than 50,000 years old; much older than that and the expanding shell would be too spread out to be visible.

QUESTION: What is the difference between a meteor and a meteorite?

ANSWER: A meteor is a tiny sand grain or speck of dust or rock (which can be made of stone, iron, or both) from space, traveling through the Earth's atmosphere. If the rock is big enough and does not burn up in the Earth's atmosphere, it may land on the

Earth's surface. At this point it is known as a meteorite. So the difference between the two is really not a matter of what they are composed of, but rather of how much matter they are composed of and, consequently, where they are ultimately seen and found.

QUESTION: Is there any difference between a "falling star", "shooting star", and "meteor"?

ANSWER: No. They are all different names for the same thing: a piece of dust or rock that burns up as it speedily enters Earth's atmosphere. Further, "falling" or "shooting" stars are not stars at all: real stars are light-years away from Earth, and real stars are NOT hurling themselves into Earth's atmosphere to burn up. If a star were that close, it is we inhabitants of Earth who would "burn up" (literally!!), in addition to the nearby "space rocks" that enter Earth's atmosphere (that is, meteors).

QUESTION: Can the current Space Shuttle make a trip to the Moon?

ANSWER: No. The Space Shuttle was not designed for travel to the moon. The main engines and solid rocket boosters are not powerful enough to launch the Shuttle to the Moon, and the Shuttle as currently designed would be unable to carry all the extra needed fuel and supplies. The Space Shuttle was designed to fly in what is called "low-Earth-orbit", making the outer limit of the Space Shuttle's orbit about 600 miles above the Earth's surface. The Moon however, is an average distance of about 230,000 miles from Earth, almost 400 times further than the farthest possible orbit that the Shuttle is designed to function in right now!!

ASTRONOMY AND TELESCOPE "LINGO

ASTRONOMY "LINGO": COSMOLOGY: The study of the origin, evolution, large-scale structure, and destiny of the Universe.

TELESCOPE "LINGO": COSMOS: A very versatile and automated plate-scanning equipment system located at the Royal Observatory in Edinburgh, Scotland. This system is used primarily for the extraction of data from the UK Schmidt and other research Schmidt telescopes.

ASTRONOMY "FUN FACTS"

★★ Jupiter is the fastest rotating planet in the solar system, spinning on its axis once every approximately 10 hours at its equator. A stationary object on Jupiter's equator would be traveling at considerably more speed (almost 28,000 miles per hour) than the escape velocity of our own planet Earth !

★★ The Moon's shadow (a dark disk almost 170 miles wide), travels across the Earth at 1,040 miles per hour during a total eclipse of the Sun. The longest possible time to observe a total solar eclipse from one location on Earth is 7 minutes, 40 seconds. However, following the Moon's shadow in a supersonic jetliner would enable the observer to see totality for approximately three and one-half hours!! But it would be an expensive eclipse indeed!

★★ Just one pound of hydrogen - converted into helium by nucleosynthetic processes in the core of the Sun - would release the same amount of energy as would ten tons (20,000 pounds) of coal here on Earth!

PLANETARY FOCUS

"Planetary Focus" is a periodic column that publishes occasionally in the EAS "Stargazer"; it last published for the combined December-January newsletter, and will return in March. See you then.

CONSTELLATIONS OF THE MONTH: LEO MINOR & CENTAURUS

LEO MINOR: The Lion Cub, as this small constellation is also known, borders on the constellations of Leo, Lynx, and Ursa Major, and ranks 52nd in overall brightness among the constellations, containing 15 stars brighter than magnitude 5.5. Its central point is located at RA=10h,11m and Dec.= +32.5 degrees. It is completely visible from latitudes North of –48 degrees, and completely invisible from latitudes South of –67 degrees; this constellation ranks 64th in overall size among the 88 official constellations. Leo Minor's only named star is Praecipua, and the nearest star to Earth within the borders of this constellation is the 11-Leo Minor A-B system, lying at 29.91 light years distance from Earth, with an absolute magnitude of 5.6 and 13.2 (for components A and B respectively; the apparent magnitudes are 5.4 and 13.0 respectively); this system is listed among the 200 nearest stars or star systems to Earth, coming in at number 157. Leo Minor has one associated meteor shower: the Leonis (or Leo) Minorids (24 Oct.), with a radiant of 10h48m and +37 degrees; its ZHR (zenithal hourly rate) is low at 3. Leo Minor has no associated Messier objects. Leo Minor does have two relatively well known galaxies available to smaller scopes and amateur astronomers under good conditions. NGC-3344 is a magnitude 10.4 face-on spiral, measuring 6.0' x 5.1' across (an 8-inch scope can show a soft glow surrounding a stellar-like nucleus); NGC-3486 is a multi-armed spiral measuring 5.5' x 4.2', with a magnitude of 10.8, and it can appear in a similar telescope as a circular haze but with little additional detail of its central areas. There is also a well-known interacting pair of galaxies:

NGC-3395 and NGC-3396. NGC-3395 is a 12.4 magnitude elongated Sc spiral, measuring 1.4' x 0.8', which Burnham states is considerably bright for being so small; NGC-3396 is classified as a 12.8 magnitude, somewhat elongated hybrid between an irregular and barred spiral galaxy, measuring 1.0' x 0.5' across. This interacting pair, which telescopically looks like a puffy reverse 'S' attached by a thin, faint cloud bridge to a somewhat smaller cumulus-looking cloud, is separated by 1.7'. Leo Minor also has several double and multiple star systems (such as F.G.W. Struve #'s 1344, 1374, 1375, 1405, 1406 and 1492; as well as Herschel 475 and 2517; Aitken 2142; and Hussey 631, 634 and 875). This small but jam-packed constellation also contains some well-known variable stars, such as R-Leonis Minoris (a long-period variable, with a visual magnitude variability from 6.3 to fainter than 13.0, a 372 day period, and spectral class varying from M7e to M8e), and U-Leonis Minoris (a semi-regular variable with a visual magnitude from 9.8 to fainter than 13.0, a 272 day period, and a spectral class of M6e). On a clear night in a dark location this winter, see if you can find some of these wonders in the constellation of Leo Minor.

CENTAURUS: The Centaur, as this constellation is also known, borders on the constellations of Antlia, Carina, Circinus, Crux, Hydra, Lupus, Musca, and Vela, and ranks 25th in overall brightness among the constellations, containing 101 stars brighter than magnitude 5.5. Its central point is located at RA=13h,01m and Dec.= -47.5 degrees. It is completely visible from latitudes South of +25 degrees, and completely invisible from latitudes North of +60 degrees; this constellation ranks 9th in overall size, taking up almost 2.6% of the entire sky. Two of Centaurus' most famous bright stars are Proxima Centauri (alpha Centauri C), and Rigel Kentaurus (alpha Centauri). Centaurus has one associated meteor shower: the alpha Centaurids (8 Feb.), and no Messier objects. Interestingly, the nearest star system to our own is Rigel Kentaurus (generally referred to as Alpha Centauri), at a distance of 4.39 light years. It is a triple star system, the brightest two forming a wonderful telescopic double. The dimmer of the three

is actually Proxima Centauri, which lies about 0.1 light years closer than the other two stars, and is thus the closest star to our own sun. The entire triple star system is the third brightest of all the night-time stars, shining at a magnitude of –0.27. Because of the large proper motion of Alpha Centauri, in about 4,000 years, Alpha and Beta Centauri together will become a beautiful double star.

Perhaps most well known of all of the other features of this constellation is the Omega Centauri globular cluster, generally regarded as the finest and most beautiful in all of the sky. Also known as NGC 5139, the total visual magnitude of this cluster is 3.7 and it takes up a diameter of almost ½ degree , but its more southerly declination (-47 degrees) makes it a difficult object at latitudes above 35 degrees North. NGC 5139 has a surprising range of metal content as well as possibly age of its members; it is also an X-ray source.

Centaurus also has some beautiful and famous galaxies to boast as well. NGC-4945 is a large, nearly edge-on barred spiral that may even be visible in some larger binoculars. This beautiful galaxy has a magnitude of approximately 9.2, and is generally classified as an SBc galaxy. It measures approximately 20.0' x 4.5'. NGC-4945 is located approximately 30' northeast of Xi Centauri. Another Centaurus galaxy is NGC-5128, a peculiar S0 galaxy, with a magnitude of 7.2, and measuring 10.0' x 8.0'. NGC-5128 is an active galaxy, demonstrating powerful and chaotic disruptions within its core, and is located 4 megaparsecs away from Earth, making it close enough for larger backyard scopes to show some structural detail regarding both NGC-5128's halo and dust lane. The dust lane, a broad equatorial band, bisects the galaxy, which brightens towards its center; the 'split' dust lane is thicker and twisted at opposites sides of the galaxy's edge, and the lane's bright edges show clumps of nebulosity, and more extensive and fainter nebulosity lying inside the dust lane. This latter nebulosity is composed of chains of O- and B-type stars, and is visible to Earth because it is projected in front of and against the dust band. NGC-5128 is identified with Centaurus-A, a very intense radio and X-ray source (as well as a source of both infrared and gamma radiation). The NGC-5128/Centaurus-A association is the nearest active galaxy to Earth. Its radio structure consists of essentially two large lobes approximately symmetrical about the central nucleus, from which a jet (broken up into several knots) extends toward one of the radio lobes.

Centaurus-A is also a bright X-ray source, with variable time intervals of as low as a few days, which suggests that most of the X-ray emission is emitted from the nucleus. Einstein Observatory observations have also demonstrated an X-ray jet along the axis of the radio lobes. The constellation of Centaurus has a midnight culmination date of March 30th, so if you are planning on "snow-birding" very far south in the next few months, try to get out and enjoy some of the beauties of this constellation this late winter and spring.

"MIRROR IMAGES"

"MIRROR" IMAGES": This column is primarily a bi-monthly column. It last published for the combined December-January newsletter, and will again publish in March; see you then!

ASTRONOMICAL NOTES -- ON & OFF THE WEB…

GREEN COMET APPROACHES EARTH – FEB 24TH

In 1996, a 7-year-old boy in China bent over the eyepiece of a small telescope and saw something that would change his life--a comet of flamboyant beauty, bright and puffy with an active tail. At first he thought he himself had discovered it, but no, he learned, two men named "Hale" and "Bopp" had beat him to it. Mastering his disappointment, young Quanzhi Ye resolved to find his own comet one day. And one day, he did.

Fast forward to a summer afternoon in July 2007. Ye, now 19 years old and a student of meteorology at China's Sun Yat-sen University, bent over his desk to stare at a black-and-white star field. The photo was taken nights before by Taiwanese astronomer Chi Sheng Lin on "sky patrol" at the Lulin Observatory. Ye's finger moved from point to point--and stopped. One of the stars was not a star, it was a comet, and this time Ye saw it first.

Comet Lulin, named after the observatory in Taiwan where the discovery-photo was taken, is now approaching Earth. "*It is a green beauty that could become visible to the naked eye any day now*," says Ye.

Amateur astronomer Jack Newton sends this photo from his backyard observatory in Arizona: http://science.nasa.gov/headlines/y2009/images/greencomet/Jack-Newton1.jpg "*My retired eyes still cannot see the brightening comet*," says Newton, "*but my 14-inch telescope picked it up quite nicely on Feb. 1st*." The comet makes its closest approach to Earth (0.41 AU) on Feb. 24, 2009. Current estimates peg the maximum brightness at 4th or 5th magnitude, which means dark country skies would be required to see it. No one can say for sure, however, because this appears to be Lulin's first visit to the inner solar system and its first exposure to intense sunlight. Surprises are possible.

Lulin's green color comes from the gases that make up its Jupiter-sized atmosphere. Jets spewing from the comet's nucleus contain cyanogen (CN: a poisonous gas found in many comets) and diatomic carbon (C2). Both substances glow green when illuminated by sunlight in the near-vacuum of space.

In 1910, many people panicked when astronomers revealed Earth would pass through the cyanogen-rich tail of Comet Halley. False alarm: The wispy tail of the comet couldn't penetrate Earth's dense atmosphere; even it if had penetrated, there wasn't enough cyanogen to cause real trouble. Comet Lulin will cause even less

trouble than Halley did. At closest approach in late February, Lulin will stop 38 million miles short of Earth, utterly harmless.

To see Comet Lulin with your own eyes, set your alarm for 3 am. The comet rises a few hours before the sun and may be found about 1/3rd of the way up the southern sky before dawn. Here are some dates when it is especially easy to find:

Feb. 24th: Closest approach! On this special morning, Lulin will lie just a few degrees from Saturn in the constellation Leo. Saturn is obvious to the unaided eye, and Lulin could be as well. If this doesn't draw you out of bed, nothing will. http://science.nasa.gov/headlines/y2009/images/greencomet/skymap_north_lulin_24feb09.gif

Ye notes that Comet Lulin is remarkable not only for its rare beauty, but also for its rare manner of discovery. "*This is a 'comet of collaboration' between Taiwanese and Chinese astronomers*," he says. "*The discovery could not have been made without a contribution from both sides of the Strait that separates our countries. Chi Sheng Lin and other members of the Lulin Observatory staff enabled me to get the images I wanted, while I analyzed the data and found the comet*."

Somewhere this month, Ye imagines, another youngster will bend over an eyepiece, see Comet Lulin, and feel the same thrill he did gazing at Comet Hale-Bopp in 1996. And who knows where that might lead...? "*I hope that my experience might inspire other young people to pursue the same starry dreams as myself*," says Ye. http://science.nasa.gov/headlines/y2009/04feb_greencomet.htm

HOW MARTIAN WINDS MAKE ROCKS WALK

Rocks on Mars are on the move, rolling into the wind and forming organized patterns, according to new research. The new finding counters the previous explanation of the evenly spaced arrangement of small rocks on Mars. That explanation suggested the rocks were picked up and carried downwind by extreme high-speed winds thought to occur on Mars in the past. Images taken by the Mars Exploration Rover Spirit show small rocks regularly spaced about 5 to 7 centimeters apart on the intercrater plains between Lahontan Crater and the Columbia Hills.

Although Mars is a windy planet, it would be difficult for the wind to carry the small rocks, which range in size from a quarter to a softball, said Jon D. Pelletier, associate professor of geosciences.

Pelletier and his colleagues suggest that wind blows sand away from the front of the rock, creating a pit, and then deposits that sand behind the rock, creating a hill.

The rock then rolls forward into the pit, moving into the wind, he said. As long as the wind continues to blow, the process is repeated and the rocks move forward. This explanation does not require extreme winds, Pelletier said. "*You get this happening five, 10, 20 times then you start to really move these things around*," he said. "*They can move many times their diameter*."

The process is nearly the same with a cluster of rocks. However, with a cluster of rocks, those in the front of the group shield those in the middle or on the edges from the wind, Pelletier said. Because the middle and outer rocks are not directly hit by the wind, the wind creates pits to the sides of those rocks. Therefore, they roll to the side, not directly into the wind, and the cluster begins to spread out.

When Leier was a graduate student, he told Pelletier about an experiment on the upwind migration of rocks that Steidtmann, Leier's thesis advisor, had conducted. Steidtmann had studied upwind migration about 30 years ago. He used a wind tunnel to see how pebbles on sand moved in the wind. Steidtmann's research showed that the rocks moved upwind and that over time, a regular pattern emerged. Pelletier wasn't sure how he could use the idea. Sometime later, while attending a lecture that showed pictures of uniformly organized rocks on Mars, Pelletier recalled his conversations with Leier about Steidtmann's experiments -- and it all came together. To investigate the regular patterns of the rocks on Mars, Pelletier combined three standard numerical computer models. The first modeled air flow, the second modeled erosion and deposition of sand and the third modeled the rocks' movement, he said. "*We can model it on the computer to try to get a better sense of what's actually happening and to provide another sort of documentation or justification for the idea*," he said. Pelletier was the first to combine the three standard models and apply them to this new problem. He also conducted what is known as a Monte Carlo simulation, which applies his combination numerical model over and over to a random pattern of rocks to see how the rocks ultimately end up. Pelletier ran the simulation 1,000 times. The rocks ended up into a regular pattern 90 percent of the time, he said. As an independent verification, he also compared the pattern predicted by the numerical model to the distances between each rock and its nearest neighbor in the Mars images. The patterns of the Martian rocks matched what the model predicted.

Pelletier said upwind migration of rocks also occurs on Earth. Co-author Leier wrote in an e-mail, "*Something as seemingly mundane as the distribution of rocks on a sandy, wind-blown surface can actually be used to tell us a lot about how wind-related processes operate on a place as familiar as the Earth and as alien as Mars*." However, because plants and animals can alter wind patterns and rearrange rocks, it is much more difficult to study this process on Earth, Pelletier said.

Of Mars' mysterious walking rocks, he said, "*This is a neat problem, but there are bigger fish to fry*." Pelletier plans to apply the same numerical models to larger features on Mars such as sand dunes and wind-sculpted valleys and ridges called "yardangs." He said understanding the climate history of other planets and where those climates went awry can help in understanding our own climate system. http://geomorphology.geo.arizona.edu/ http://marsrovers.nasa.gov/home/index.html

GEOLOGIC FEATURES IN MARTIAN CRATERS SUGGEST DEPOSITION & FLOW OF WATER AND / OR ICE

Scientists at the Planetary Science Institute have found further evidence for the large role that water has likely played in shaping the Martian landscape. Their results, which will be published in Icarus, provide strong evidence that multiple wet and/or icy climate cycles have shaped the topography of the planet's large craters.

"*Studying crater degradation in potentially ice-rich environments is vital to understanding the geology of craters and their surroundings, as well as for determining whether the ice comes from the atmosphere or from below the ground*," said Daniel Berman, an associate research scientist and lead author of the paper. Berman, along with Senior Scientist David Crown and Research Scientist Leslie Bleamaster III, surveyed the geologic features in two sets of mid-latitude craters. Each set included about 100 craters, with the first set in the Arabia Terra region of the northern hemisphere and the second set in an area east of Hellas basin in the southern hemisphere.

The researchers selected craters that are greater than 20 km (about 12.5 miles) in diameter that have been completely or nearly completely photographed by cameras on various spacecraft, including the Mars Odyssey THEMIS VIS camera, the

Mars Global Surveyor Mars Orbiter Camera, and the Viking Orbiter cameras. They looked specifically for the following erosional or depositional features, the number and sizes of those features, and how the features are oriented (i.e., whether they face the equator or the planet's pole in their hemisphere):

-- Lobate flows - Lobe-shaped flow features that have pitted surfaces and raised ridges on their lateral margins are observed on the walls of some craters. These lobes resemble rock glaciers on Earth.

-- Channels - Narrow channels often breach crater walls and extend outside the craters, as well as across crater floors, These channels may have been formed by flowing water.

-- Crater-wall valleys - Trough-like crater-wall valleys, wider than the above-mentioned channels, typically start at the top of the crater rim and terminate where the wall meets the floor. These valleys are sometimes filled with rough-textured deposits, which may be glacial.

-- Gullies and alcoves - Gullies are typically composed of three parts: alcoves at the head of a channel, channels, and debris fans, and are thought to have been formed by flowing water.

-- Arcuate ridges - These are small, arc-shaped ridges that enclose depressions at the base of crater walls, often below gullies. Berman interprets these to be glacial moraines, remnants of glacial deposits that have since evaporated.

-- Debris aprons - These aprons are pitted and lineated deposits on crater floors. They are similar to debris-covered glaciers or ice-rich landslides seen on Earth.

All of these features suggest a landscape shaped by liquid water and/ or ice, Berman said. He found that lobate flows, gullies, and arcuate ridges on the crater walls between latitudes of 30 to 45 degrees face the pole in their hemisphere, whereas equator-facing orientations are more common than pole-facing ones at latitudes between 45 and 60 degrees. In the southern study area, narrow channels generally had pole-facing orientations, whereas wider valleys generally have equator-facing orientations.

The features' pole-facing or equator-facing orientations could result from uneven heating of the crater walls. Ice on walls that get more sunlight would melt faster, causing more water to flow and form the gullies and other features. Unlike Earth, whose axis only oscillates through an arc of about four degrees over millions of years, Mars appears to have an axis that tilts between vertical and as much as 60 degrees, according to recent studies.

Such tilting could enhance ice deposition, Berman said. When one pole begins leaning toward the sun, ice evaporates and then falls as snow at the other pole, which is getting little sunlight. Such tilting could have caused ice sheets to form in areas that are now ice-free, he added. Further evidence for flowing ice is found on the crater floors, Berman observed. He found that the floors of small craters slope away from the walls that exhibit erosional/depositional features toward the more pristine ones. These slopes have inclines of about 0.5 to 3 degrees. This suggests that ice-rich materials flowed from one crater wall to the other. Tilting floors are less evident in larger craters, although some have gradually sloping floors where debris apron material is evident.

The team's crater study has led them to make the following conclusions:

-- The orientation of erosional/depositional features (whether they face the equator or the pole) suggests a direct relationship to total solar heating along the crater walls.

-- Differences in the shape and size of various erosional/depositional features can be explained by differences in crater-wall slopes, local topography and orientation.

-- The geologic features and suites of features found in the craters may have been created by multiple cycles of ice-sheet formation in response to changes in the tilt of Mars' rotation axis.

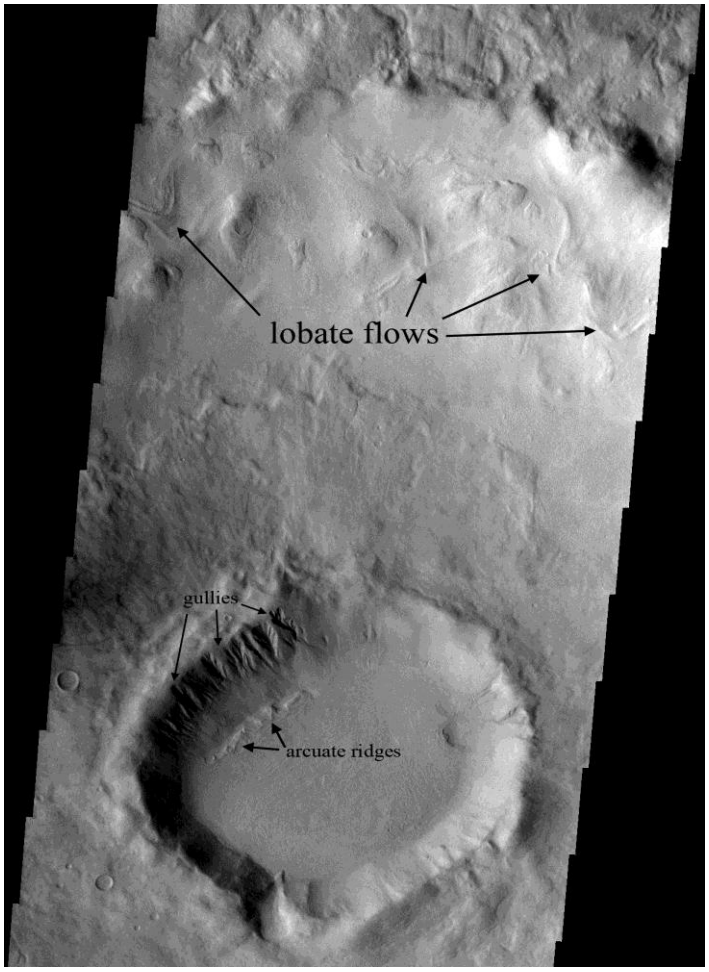


Figure: THEMIS VIS image V07798008, centered at -40.32° N, 132.5° E, showing a 16 km diameter crater with gullies and arcuate ridges on its north, pole-facing interior wall in the center of a larger (60 km diameter) crater with lobate flows on its north, interior wall. Image width is 17.4 km. http://www.psi.edu/press/

SPIRIT ROVER GETS BOOST FROM CLEANER SOLAR PANELS

A small but important uptick in electrical output from the solar panels on Mars Exploration Rover Spirit this month indicates a beneficial Martian wind has blown away some of the dust that has accumulated on the panels. The cleaning boosts Spirit's daily energy supply by about 30 watt- hours, to about 240 watt-hours from 210 watt-hours. The rover uses about 180 watt-hours per day for basic survival and communications, so this increase roughly doubles the amount of discretionary power for activities such as driving and using instruments. Thirty watt-hours is the amount of energy used to light a 30-watt bulb for one hour.

"*We will be able to use this energy to do significantly more driving*," said Colette Lohr, a rover mission manager. "*Our drives have been averaging about 50 minutes, and energy has usually been the limiting factor. We may be able to increase that to drives of an hour and a half*."

Jennifer Herman, a rover team engineer, found the first evidence for the new cleaning event in engineering data from the Martian day 1,812 of Spirit's mission on the Red Planet (Feb. 6, 2009) and confirmed it from the following two days' data. Before the event, dust buildup on the solar array had reached the point where only 25 percent of sunlight hitting the array was getting past the dust to be used by the photovoltaic cells. Afterwards, that increased to 28 percent. "*It may not sound like a lot, but it is an important increase*," Herman said.

Spirit has driven about 9 meters (about 30 feet) since getting around a rock that temporarily blocked its progress on Jan. 31. The team's goal in coming weeks is to navigate the rover over or around a low plateau called "Home Plate" to get to an area targeted for scientific studies on the other side of Home Plate.

The last prior cleaning event that was as beneficial as this one was in June 2007. Winds cleaned off more of the dust that time, but a dust storm in subsequent weeks undid much of the benefit.

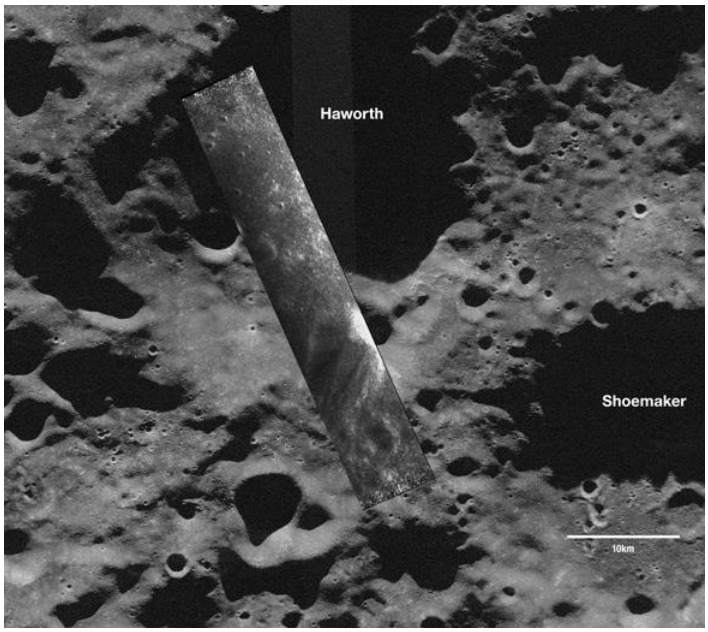
Spirit's twin rover, Opportunity, drove 135.9 meters (446 feet) on Feb. 10. Opportunity's cumulative odometry is 14.36 kilometers (8.92 miles) since landing in January 2004, including 2.58 kilometers (1.6 miles) since climbing out of Victoria Crater on Aug. 28, 2008. Spirit and Opportunity have been operating on Mars for more than five years in exploration missions originally planned to last for three months. http://www.jpl.nasa.gov/news/news.cfm?release=2009-020a

RADAR'S FIRST LOOK INSIDE MOON'S SHADOWED CRATERS

Using a radar flying aboard India's Chandrayaan-1 spacecraft, scientists are getting their first look inside the moon's coldest, darkest craters. The Mini-SAR instrument, a lightweight, synthetic aperture radar, has passed its initial in-flight tests and sent back its first data. The images show the floors of permanently-shadowed polar craters on the moon that aren't visible from Earth. Scientists are using the instrument to map and search the insides of the craters for water ice.

"*The only way to explore such areas is to use an orbital imaging radar such as Mini-SAR*," said Benjamin Bussey, deputy principal investigator for Mini-SAR. "*This is an exciting first step for the team which has worked diligently for more than three years to get to this point*."

The images, taken on Nov. 17, 2008, cover part of the Haworth crater at the moon's south pole and the western rim of Seares crater, an impact feature near the north pole. Bright areas in each image represent either surface roughness or slopes pointing toward the spacecraft. Further data collection by Mini-SAR and analysis will help scientists to determine if buried ice deposits exist in the permanently shadowed craters near the moon's poles.



These first images and other information about Mini-SAR, also known as Mini-RF, can be found at: http://www.nasa.gov/mini-rf

"*During the next few months we expect to have a fully calibrated and operational instrument collecting valuable science data at the moon*," said Jason Crusan, program executive for the Mini-RF Program.

Mini-SAR is one of 11 instruments on the Indian Space Research Organization's Chandrayaan-1 and one of two NASA-sponsored contributions to its international payload. The other is the Moon Mineralogy Mapper, a state-of-the-art imaging spectrometer that will provide the first map of the entire lunar surface at high spatial and spectral resolution. Data from the two instruments will contribute to the agency's increased understanding of the lunar environment as it implements America's space exploration plan, which calls for robotic and human missions to the moon.

For more information about the Moon Mineralogy Mapper, visit: http://m3.jpl.nasa.gov For more information about Chandrayaan-1, visit: http://www.isro.org/Chandrayaan

ASTRONOMERS CRACK LONGSTANDING LUNAR MYSTERY

Ancient rock's magnetic field shows that moon once had a dynamo in its core. The collection of rocks that the Apollo astronauts brought back from the moon carried with it a riddle that has puzzled scientists since the early 1970s: What produced the magnetization found in many of those rocks?

The longstanding puzzle has now been solved by researchers at MIT, who carried out the most detailed analysis ever of the oldest pristine rock from the Apollo collection. Magnetic traces recorded in the rock provide strong evidence that 4.2 billion years ago the

moon had a liquid core with a dynamo, like Earth's core today, that produced a strong magnetic field.

The particular moon rock that produced the new evidence was long known to be a very special one. It is the oldest of all the moon rocks that have not been subjected to major shocks from later impacts -- something that tends to erase all evidence of earlier magnetic fields. In fact, it's older than any known rocks from Mars or even from the Earth itself.

"*Many people think that it's the most interesting lunar rock*," said Ben Weiss, senior author of a paper on the new finding being published in Science on Jan. 16. The rock was collected during the last lunar landing mission, Apollo 17, by Harrison "Jack" Schmidt, the only geologist ever to walk on the moon.

"*It is one of the oldest and most pristine samples known*," said graduate student Ian Garrick-Bethell, who was the lead author of the Science paper. "*If that wasn't enough, it is also perhaps the most beautiful lunar rock, displaying a mixture of bright green and milky white crystals*."

The team studied faint magnetic traces in a small sample of the rock in great detail. Using a commercial rock magnetometer that was specially fitted with an automated robotic system to take many readings "*allowed us to make an order of magnitude more measurements than previous studies of lunar samples*," Garrick-Bethell said. "*This permitted us to study the magnetization of the rock in much greater detail than previously possible*." And those data enabled them to rule out the other possible sources of the magnetic traces, such as magnetic fields briefly generated by huge impacts on the moon. Those magnetic fields are very short lived, ranging from just seconds for small impacts up to one day for the most massive strikes. But the evidence written in the lunar rock showed it must have remained in a magnetic environment for a long period of time – millions of years -- and thus the field had to have come from a long-lasting magnetic dynamo.

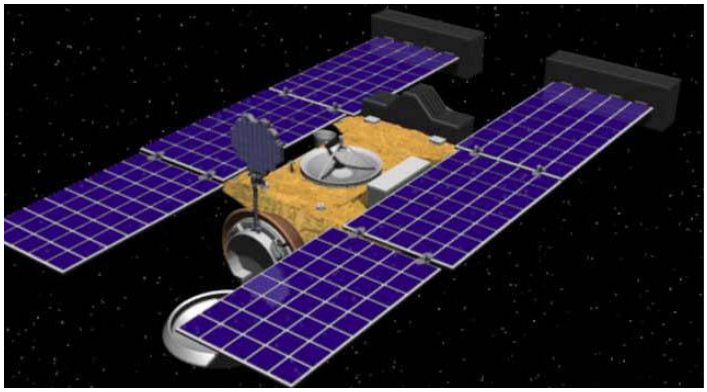
That's not a new idea, but it has been "*one of the most controversial issues in lunar science*," Weiss said. Until the Apollo missions, many prominent scientists were convinced that the moon was born cold and stayed cold, never melting enough to form a liquid core. Apollo proved that there had been massive flows of lava on the moon's surface, but the idea that it has, or ever had, a molten core remained controversial. "*People have been vociferously debating this for 30 years*," Weiss said.

The magnetic field necessary to have magnetized this rock would have been about one-fiftieth as strong as Earth's is today, Weiss said. "*This is consistent with dynamo theory*," and also fits in with the prevailing theory that the moon was born when a Mars-sized body crashed into the Earth and blasted much of its crust into space, where it clumped together to form the moon.

The new finding underscores how much we still don't know about our nearest neighbor in space, which will soon be visited by humans once again under current NASA plans. "*While humans have visited the moon six times, we have really only scratched the surface when it comes to our understanding of this world*," said Garick-Bethell. http://web.mit.edu/newsoffice/2009/moonrock-0115.html

STARDUST LOGS DECADE UNDER THE STARS

Saturday, Feb. 7, marked the 10th anniversary of the launch of NASA's well-traveled Stardust spacecraft. Launched on Feb. 7, 1999, Stardust , covered 3-billion-miles during its first seven years in space before returning the world's first samples from a known comet. Stardust's tennis racket-like, aerogel-lined collector was extended to capture particles hurtling at it at about six times the speed of a rifle bullet, as the spacecraft flew within 240 kilometers (149 miles) of comet Wild 2 in January 2004. The return capsule landed Jan. 15, 2006, in Utah, carrying both interstellar and comet particles, completing the first U.S. space mission to return extraterrestrial material from beyond the orbit of Mars. Two days later the capsule was transported to a curatorial facility at Johnson Space Center in Houston.



With its prime mission complete, NASA re-designated the Stardust mission as Stardust-NExT. Short for Stardust-New Exploration of Tempel, Stardust-NExT is a low-cost, Discovery Program mission of opportunity that will expand the investigation of comet Tempel 1 initiated by NASA's Deep Impact spacecraft. The extended mission tasks the Stardust spacecraft to fly by the comet Tempel 1 on Feb. 14, 2011. During the flyby, it will obtain high-resolution images of the comet's coma and nucleus, as well as measurements of the composition, size distribution, and flux of dust emitted into the coma. Mission planners hope Stardust-NExT will provide important new information on how Jupiter-family comets evolve and how they formed 4.6 billion years ago.

While the Stardust spacecraft is unavailable for public viewing at present (it is more than 13.5 million kilometers, or 8.4 million miles, from Earth), the public can view its sample return capsule. In Jan. 2006, the capsule became the fastest manmade object ever to enter Earth's atmosphere at over 46,400 kilometers per hour (28,800 mph). The capsule is on display at the National Air and Space Museum's Milestones of Flight Gallery in Washington. http://www.jpl.nasa.gov/news/features.cfm?feature=2022

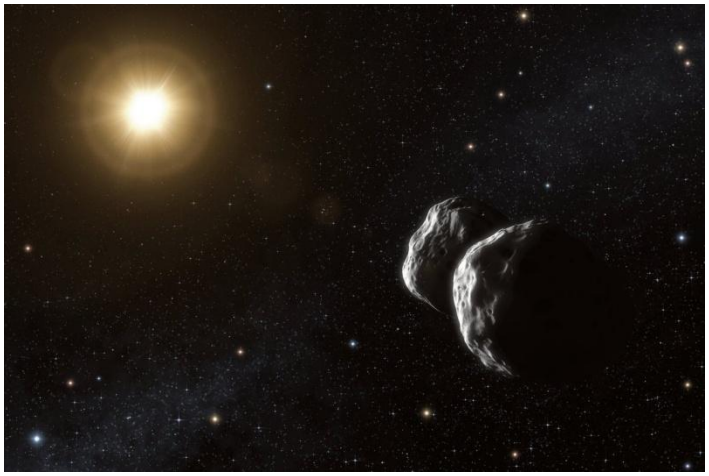
NEW METHOD TO MEASURE ASTEROIDS' SIZES & SHAPES

A team of astronomers have devised a new method for measuring the size and shape of asteroids that are too small or too far away for traditional techniques, increasing the number of asteroids that can be measured by a factor of several hundred. This method takes advantage of the unique capabilities of ESO's Very Large Telescope Interferometer (VLTI). "*Knowledge of the sizes and shapes of asteroids is crucial to understanding how, in the early days of our Solar System, dust and pebbles collected together to form larger bodies and how collisions and re-accumulation have since modified them*," says Marco Delbo, who led the study.

Direct imaging with adaptive optics on the largest ground-based telescopes such as the Very Large Telescope (VLT) in Chile (see ESO 21/05 http://www.eso.org/public/outreach/press-rel/pr-2005/pr-21-05.html and 18/07 http://www.eso.org/public/outreach/press-rel/pr-2007/pr-18-07.html , and space telescopes, or radar measurements (ESO 11/07 http://www.eso.org/public/outreach/press-rel/pr-2007/pr-11-07.html are the currently favored methods of asteroid measurement. However, direct imaging, even with adaptive optics, is generally limited to the one hundred largest asteroids of the main belt, while radar measurements are mostly constrained to observations of

near-Earth asteroids that experience close encounters with our planet.

Delbo and his colleagues have devised a new method that uses interferometry to resolve asteroids as small as about 15 km in diameter located in the main asteroid belt, 200 million kilometers away. This is equivalent to being able to measure the size of a tennis ball a distance of a thousand kilometers. This technique will not only increase the number of objects that can be measured dramatically, but, more importantly, bring small asteroids that are physically very different from the well studied larger ones into reach.



Artist's impression of the asteroid (234) Barbara. Thanks to a unique method that uses ESO's Very Large Telescope Interferometer, astronomers have been able to measure sizes of small asteroids in the main belt for the first time. Their observations also suggest that Barbara has a complex concave shape, best modeled as two bodies that may possibly be in contact. Credit: ESO/L. Calçada

The interferometric technique combines the light from two or more telescopes. Astronomers proved their method using ESO's VLTI, combining the light of two of the VLT's 8.2-metre Unit Telescopes. "*This is equivalent to having vision as sharp as that of a telescope with a diameter equal to the separation between the two VLT Unit Telescopes used, in this case, 47 meters*," says co-author Sebastiano Ligori. The researchers applied their technique to the main belt asteroid (234) Barbara, which was earlier found, by co-author Alberto Cellino, to have rather unusual properties. Although it is so far away, the VLTI observations also revealed that this object has a peculiar shape. The best fit model is composed of two bodies each the size of a major city a with diameters of 37 and 21 km â separated by at least 24 km. "*The two parts appear to overlap," says Delbo, "so the object could be shaped like a gigantic peanut or, it could be two separate bodies orbiting each other*." If Barbara proves to be a double asteroid, this is even more significant: by combining the diameter measurements with the parameters of the orbits, astronomers can then compute the density of these objects. "*Barbara is clearly a high priority target for further observations*," concludes Ligori.

Having proven the validity of their new and powerful technique, the team can now start a large observing campaign to study small asteroids. http://www.eso.org/public/outreach/press-rel/pr-2009/pr-04-09.html

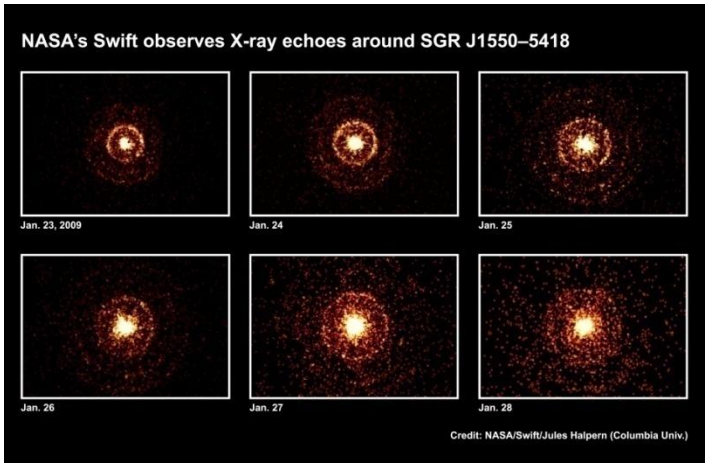
PROBING FIREWORKS FROM FLARING GAMMA-RAY STAR

Astronomers using Swift satellite and Fermi Gamma-ray Space Telescope are seeing frequent blasts from a stellar remnant 30,000 light-years away. The high-energy fireworks arise from a rare type of neutron star known as a soft-gamma-ray repeater. Such objects unpredictably send out a series of X-ray and gamma-ray flares.

"*At times, this remarkable object has erupted with more than a hundred flares in as little as 20 minutes*," said Loredana Vetere, who is coordinating the Swift observations. "*The most intense flares emitted more total energy than the sun does in 20 years*."

The object, which has long been known as an X-ray source, lies in the southern constellation Norma. During the past two years, astronomers have identified pulsing radio and X-ray signals from it. The object began a series of modest eruptions on Oct. 3, 2008, then settled down. It roared back to life Jan. 22 with an intense episode.

Because of the recent outbursts, astronomers will classify the object as a soft-gamma-ray repeater -- only the sixth known. In 2004, a giant flare from another soft-gamma-ray repeater was so intense it measurably affected Earth's upper atmosphere from 50,000 light-years away.



Swift's X-Ray Telescope (XRT) captured an apparent expanding halo around the flaring neutron star SGR J1550-5418. The halo formed as X-rays from the brightest flares scattered off of intervening dust clouds. Credit: NASA/Swift/Jules Halpern (Columbia Univ.)

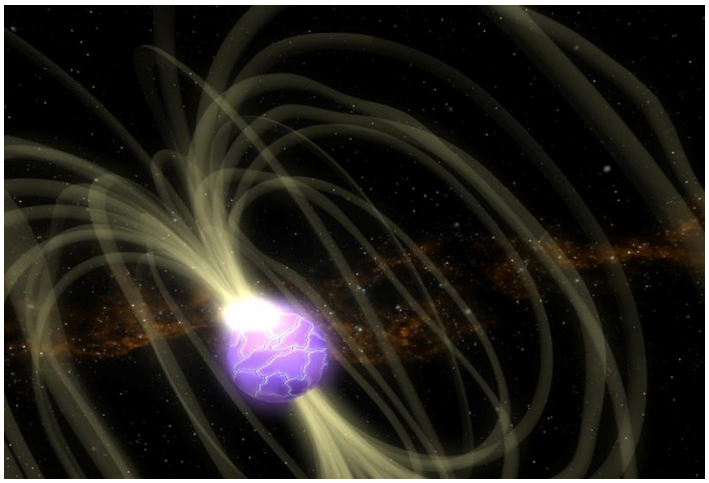
Scientists think the source is a spinning neutron star, which is the superdense, city-sized remains of an exploded star. Although only about 12 miles across, a neutron star contains more mass than the sun. The object has been cataloged as SGR J1550-5418. While neutron stars typically possess intense magnetic fields, a subgroup displays fields 1,000 times stronger. These so-called magnetars have the strongest magnetic fields of any known object in the universe. SGR J1550-5418, which rotates once every 2.07 seconds, holds the record for the fastest-spinning magnetar. Astronomers think magnetars power their flares by tapping into the tremendous energy of their magnetic fields.

"*The ability of Fermi's gamma-ray burst monitor to resolve the fine structure within these events will help us better understand how magnetars unleash their energy*," said Chryssa Kouveliotou, an astrophysicist. The object has triggered the instrument more than 95 times since Jan. 22.

Using data from Swift's X-ray telescope, Jules Halpern captured the first "light echoes" ever seen from a soft-gamma-ray repeater. Images acquired when the latest flaring episode began show what appear to be expanding halos around the source. Multiple rings form as X-rays interact with dust clouds at different distances, with closer clouds producing larger rings. Both the rings and their apparent expansion are an illusion caused by the

finite speed of light and the longer path the scattered light must travel.

"*X-rays from the brightest bursts scatter off of dust clouds between us and the star*," Halpern said. "*As a result, we don't really know the distance to this object as well as we would like. These images will help us make a more precise measurement and also determine the distance to the dust clouds*."



Gamma-rays flares from SGR J1550-5418 may arise when the magnetar's surface suddenly cracks, releasing energy stored within its powerful magnetic field. Credit: NASA/Goddard Space Flight Center Conceptual Image Lab

The Wind satellite, the Suzaku mission, and the INTEGRAL satellite also have detected flares from SGR J1550-5418. http://www.nasa.gov/mission_pages/swift/bursts/gammaray_fireworks.html For more information about the Swift satellite, visit: http://www.nasa.gov/swift For more information about the Fermi mission, visit; http://www.nasa.gov/fermi

DEAD STARS TELL STORY OF PLANET BIRTH

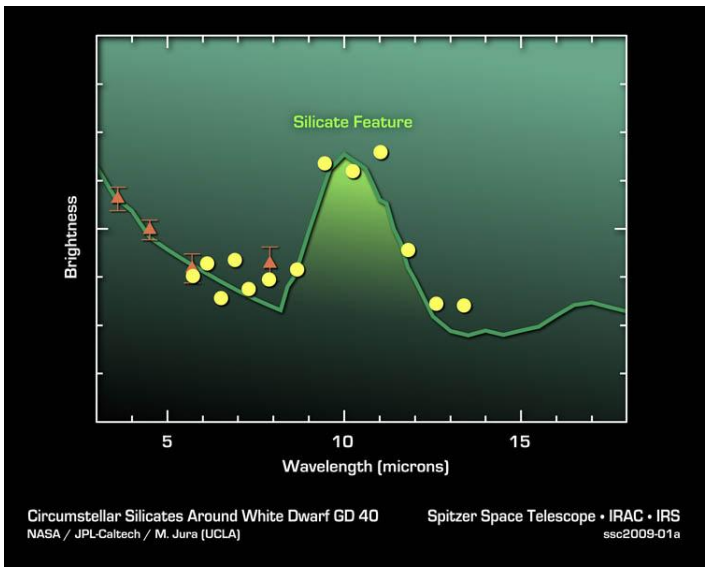
Astronomers have turned to an unexpected place to study the evolution of planets -- dead stars. Observations made with the Spitzer Space Telescope reveal six dead "white dwarf" stars littered with the remains of shredded asteroids. This might sound pretty bleak, but it turns out the chewed-up asteroids are teaching astronomers about the building materials of planets around other stars.

This artist's concept illustrates a dead star, or "white dwarf," surrounded by the bits and pieces of a disintegrating asteroid. Image credit: NASA/JPL-Caltech

So far, the results suggest that the same materials that make up Earth and our solar system's other rocky bodies could be common in the universe. If the materials are common, then rocky planets could be, too.

"*If you ground up our asteroids and rocky planets, you would get the same type of dust we are seeing in these star systems*," said Michael Jura. "*This tells us that the stars have asteroids like ours -- and therefore could also have rocky planets*." Jura is the lead author of a paper on the findings. Asteroids and planets form out of dusty material that swirls around young stars. The dust sticks together, forming clumps and eventually full-grown planets. Asteroids are the leftover debris. When a star like our sun nears the end of its life, it puffs up into a red giant that consumes its innermost planets, while jostling the orbits of remaining asteroids and outer planets. As the star continues to die, it blows off its outer layers and shrinks down into a skeleton of its former self -- a white dwarf.

Sometimes, a jostled asteroid wanders too close to a white dwarf and meets its demise -- the gravity of the white dwarf shreds the asteroid to pieces. A similar thing happened to Comet Shoemaker Levy 9 when Jupiter's gravity tore it up, before the comet ultimately smashed into the planet in 1994. Spitzer observed shredded asteroid pieces around white dwarfs with its infrared spectrograph, an instrument that breaks light apart into a rainbow of wavelengths, revealing imprints of chemicals. Previously, Spitzer analyzed the asteroid dust around two so-called polluted white dwarfs; the new observations bring the total to eight. "*Now, we've got a bigger sample of these polluted white dwarfs, so we know these types of events are not extremely rare*," said Jura. In all eight systems observed, Spitzer found that the dust contains a glassy silicate mineral similar to olivine and commonly found on Earth. "*This is one clue that the rocky material around these stars has evolved very much like our own*," said Jura.



This plot of data from Spitzer Space Telescopes shows that asteroid dust around a dead "white dwarf" star contains silicates -- a common mineral on Earth. Image credit: NASA/JPL-Caltech/UCLA

The Spitzer data also suggest there is no carbon in the rocky debris -- again like the asteroids and rocky planets in our solar system, which have relatively little carbon.

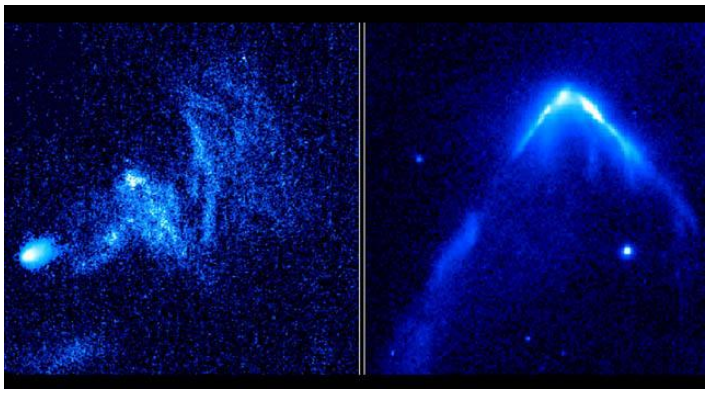
A single asteroid is thought to have broken apart within the last million years or so in each of the eight white-dwarf systems. The biggest of the bunch was once about 200 kilometers (124 miles) in diameter, a bit larger than Los Angeles County.

Jura says the real power of observing these white dwarf systems is still to come. When an asteroid "bites the dust" around a dead star, it breaks into very tiny pieces. Asteroid dust around living stars, by contrast, is made of larger particles. By continuing to use spectrographs to analyze the visible light from this fine dust, astronomers will be able to see exquisite details -- including information about what elements are present and in what abundance. This will reveal much more about how other star systems sort and process their planetary materials. "*It's as if the white dwarfs separate the dust apart for us*," said Jura.
http://www.jpl.nasa.gov/news/news.cfm?release=2009-001
http://www.spitzer.caltech.edu/spitzer http://www.nasa.gov/spitzer

HUBBLE FINDS STARS THAT 'GO BALLISTIC'

Some stars go ballistic, racing through interstellar space like bullets and tearing through clouds of gas. Images from Hubble Space Telescope, taken by Raghvendra Sahai and colleagues reveal 14 of these young, runaway stars. The stars are plowing through regions of dense interstellar gas, creating brilliant arrowhead structures and trailing tails of glowing gas. These arrowheads, or bow shocks, form when the stars' powerful stellar winds, streams of matter flowing from the stars, slam into surrounding dense gas. The phenomenon is similar to that seen when a speeding boat pushes through water on a lake. "*We think we have found a new class of bright, high-velocity stellar interlopers*," said Sahai. "*Finding these stars is a complete surprise because we were not looking for them. When I first saw the images, I said, 'Wow. This is like a bullet speeding through the interstellar medium.' Hubble's sharp 'eye' reveals the structure and shape of these bow shocks*."

The astronomers can only estimate the ages, masses and velocities of these renegade stars. The stars appear to be young -- just millions of years old. Their ages are based partly on their strong stellar winds. Most stars produce powerful winds either when they are very young or very old. Only very massive stars greater than 10 times the sun's mass have stellar winds throughout their lifetimes. But the objects observed by Hubble are not very massive because they do not have glowing clouds of ionized gas around them. They are medium-sized stars that are a few to eight times more massive than the sun. The stars are not old because the shapes of the nebulae around aging, dying stars are very different, and old stars are almost never found near dense interstellar clouds.



The stars in these Hubble images are among 14 young runaway stars spotted by the Advanced Camera for Surveys between October 2005 and July 2006. Image credit: NASA/ESA/JPL

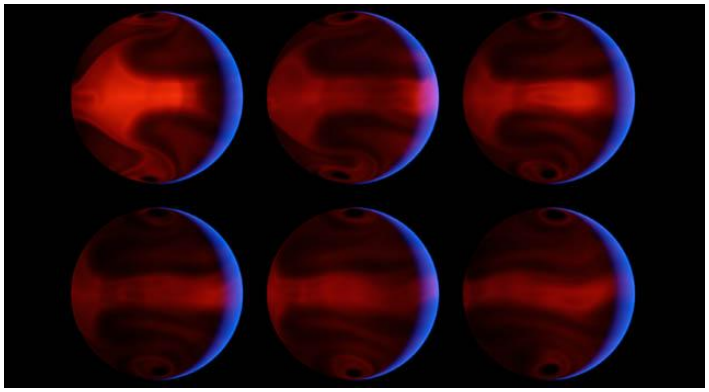
Depending on their distance from Earth, the bullet-nosed bow shocks could be 100 billion to a trillion miles wide (the equivalent of 17 to 170 solar system diameters, measured out to Neptune's orbit). The bow shocks indicate that the stars are traveling fast, more than 180,000 kilometers an hour (more than 112,000 miles an hour) with respect to the dense gas they are plowing through, which is roughly five times faster than typical young stars.

"*The high-speed stars were likely kicked out of their homes, which were probably massive star clusters*," Sahai said. There are two possible ways this stellar expulsion could have happened. One way is if one star in a binary system exploded as a supernova and the partner got kicked out. Another scenario is a collision between two binary-star systems or a binary system and a third star. One or more of these stars could have picked up energy from the interaction and escaped the cluster. Assuming their youthful phase lasts only a million years and they are moving at roughly 180,000 kilometers an hour (about 112,000 mph), the stars have traveled about 160 light-years.

Runaway stars have been seen before. The Infrared Astronomical Satellite, which performed an all-sky infrared survey in 1983, spied a few similar-looking objects. The first observation of these objects was in the late 1980s. But those stars produced much larger bow shocks than the stars in the Hubble study, suggesting that they are more massive stars with more powerful stellar winds. "*The stars in our study are likely the lower-mass and/or lower-speed counterparts to the massive stars with bow shocks detected by the Infrared Astronomical Satellite*," Sahai explained. "*We think the massive runaway stars observed before were just the tip of the iceberg. The stars seen with Hubble may represent the bulk of the population, both because many more lower-mass stars inhabit the universe than higher- mass stars, and because a much larger number are subject to modest speed kicks*."
http://www.jpl.nasa.gov/news/news.cfm?release=2009-002

NEW PLANET WITH WILD TEMPERATURE SWINGS

Spitzer Space Telescope has observed a planet that heats up to red-hot temperatures in a matter of hours before quickly cooling back down. The "hot-headed" planet is HD 80606b, a gas giant that orbits a star 190 light-years from Earth. It was already known to be quite unusual, with an orbit shuttling it nearly as far out as Earth is from our sun, and much closer in than our planet Mercury.

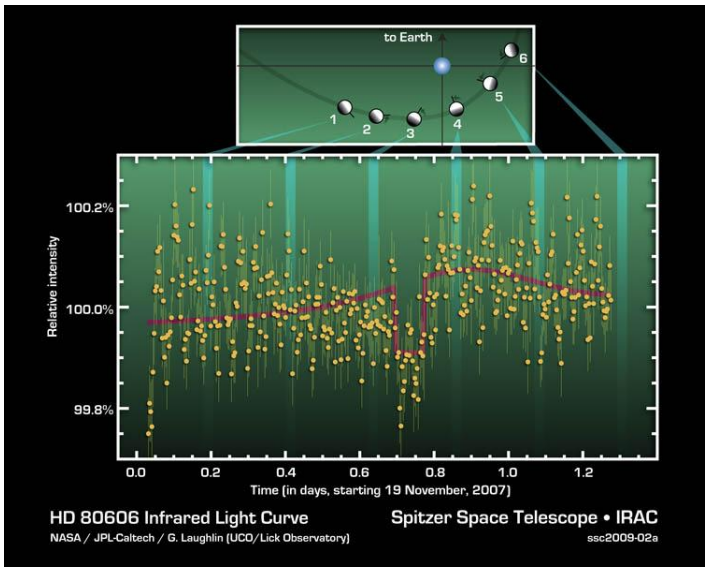


These computer-generated images chart the development of severe weather patterns on the highly eccentric exoplanet HD 80606b during the days after its closest approach to its parent star.

Astronomers used Spitzer, an infrared observatory, to measure heat emanating from the planet as it whipped behind and close to its star. In just six hours, the planet's temperature rose from 800 to 1,500 Kelvin (980 to 2,240 degrees Fahrenheit). "*We watched the development of one of the fiercest storms in the galaxy*," said astronomer Greg Laughlin of the Lick Observatory. "*This is the first time that we've detected weather changes in real time on a planet outside our solar system*." Laughlin is lead author of a new report about the discovery.

HD 80606b was originally discovered in 2001 by a Swiss planet-hunting team led by Dominique Naef. Using a method known as the Doppler-velocity technique, the astronomers learned that the planet is wildly eccentric, with an orbit more like a comet's than a planet's. HD 80606b's orbit takes it as far out as 0.85 astronomical units from its star, and as close in as 0.03 astronomical units (one astronomical unit is the distance between Earth and the sun). The planet takes about 111 days to circle its star, but it spends most of its time at farther distances while zipping through the closest part of its orbit in less than a day. (This is a consequence of Kepler's Second Law of Planetary Motion, which states that orbiting bodies -- planets and comets -- sweep out an equal area in equal time.) "*If you could float above the clouds of this planet, you'd see its sun growing larger and larger at faster and faster rates, increasing in brightness by almost a factor of 1,000*," said Laughlin.

Spitzer observed HD 80606b before, during and just after its closest passage to the star in November of 2007, as the planet sizzled under the star's heat. When Laughlin and his colleagues planned the observation, they did not know whether the planet would disappear completely behind the star, an event called a secondary eclipse, or whether it would remain in view. Luckily for the team, the planet did indeed temporarily disappear from view, providing the planet's initial and final temperatures (had the planet had not been eclipsed, the team would have known only the temperature change without knowing the starting point).



This figure shows changes in the planet's heat, or infrared light, measured by Spitzer from 30 hours of observations.

The extreme temperature swing observed by Spitzer indicates that the air near the planet's gaseous surface must quickly absorb and lose heat. This type of atmospheric information revealing how a planet responds to sudden changes in heating -- an extreme version of seasonal change -- had never been obtained before for any exoplanet (a planet orbiting another star).

"*By studying this planet under such extreme circumstances, we figure out how it handles heat -- does it retain it or dissipate it? In this case, the answer is that the planet releases the heat right away*," said Laughlin. "*We were essentially able to perform the 'thought experiment' -- what would happen to a planet like Jupiter if we could drag it very close to the sun?"*

Laughlin and his colleagues say that a key factor in being able to make the observations is the planet's eccentric orbit. Unlike so-called hot Jupiter planets that remain in tight orbits around their stars, HD 80606b rotates around its axis roughly every 34 hours. Hot Jupiters, on the other hand, are thought to be tidally locked like our moon, so one side always faces their stars. Because HD 80606b spins on its axis many times per orbit, the astronomers were able to measure how its atmosphere responds to being baked by the star. "*The planet is spinning at a fast enough rate for the planet's hot spot to come into view*," said co-author Drake Deming. "*The hot spot can't hide*."

Amateur and professional astronomers alike are gearing up to observe HD 80606b this coming Valentine's Day, when it will swing around the front of its star. There's a 15 percent chance that the planet will eclipse its star, an event known as the primary transit. If so, the event would not only be remarkable to see, but would also provide more details about the nature of this temperamental world.
http://www.jpl.nasa.gov/news/news.cfm?release=2009-010
http://www.spitzer.caltech.edu/spitzer . http://planetquest.jpl.nasa.gov

THOMAS HARRIOT: PRE-GALILEO TELESCOPIC ASTRONOMER

This year the world celebrates the International Year of Astronomy (IYA2009), marking the 400th anniversary of the first drawings of celestial objects through a telescope. This first has long been attributed to Galileo Galilei, the Italian who went on to play a leading role in the 17th century scientific revolution. But astronomers and historians in the UK are keen to promote a lesser-known figure, English polymath Thomas Harriot, who made the first drawing of the Moon through a telescope several months earlier, in July 1609.

Historian Dr Allan Chapman of the University of Oxford explains how Harriot not only preceded Galileo but went on to make maps of the Moon's surface that would not be bettered for decades. Harriot lived from 1560 to 1621. He studied at St Mary's Hall (now part of Oriel College), Oxford, achieving his BA in 1580 before becoming a mathematical teacher and companion to the explorer Sir Walter Raleigh. In the early 1590s Raleigh fell from royal favor and was imprisoned in the Tower of London.

By 1609, Harriot had acquired his first 'Dutch trunke' (telescope). He turned it towards the Moon on 26 July, becoming the first astronomer to draw an astronomical object through a telescope. The crude lunar sketch shows a rough outline of the lunar terminator (the line marking the division between night and day on the Moon, as seen from the Earth) and includes a handful of features like the dark areas Mare Crisium, Mare Tranquilitatis and Mare Foecunditatis. Harriot went on to produce further maps from 1610 to 1613. Not all of these are dated, but they show an increasing level of detail. By 1613 he had created two maps of the whole Moon, with many identifiable features such as lunar craters that crucially are depicted in their correct relative positions. The earliest telescopes of the kind used by Harriot (and Galileo) had a narrow field of view, meaning that only a small portion of the Moon could be seen at any one time and making this work all the more impressive. No better maps would be published for several decades. Despite his innovative work, Harriot remains relatively unknown. Unlike Galileo, he did not publish his drawings. Dr Chapman attributes this to his comfortable position as a 'well-maintained philosopher to a great and wealthy nobleman' with a generous salary (somewhere between 120 Sterling Pounds and 600 Sterling Pounds per year). Harriot had comfortable housing and a specially provided observing chamber on top of Sion House, all of which contrasted with Galileo's financial pressures.

Dr Chapman believes that the time has come to give Harriot the credit he deserves. "*Thomas Harriot is an unsung hero of science. His drawings mark the beginning of the era of modern astronomy we now live in, where telescopes large and small give*

us extraordinary information about the Universe we inhabit." Professor Andy Fabian, President of the Royal Astronomical Society, agrees. "*As an astrophysicist of the 21st century, I can only look back and marvel at the work of 17th century astronomers like Thomas Harriot. The world is right to celebrate Galileo in the International Year of Astronomy -- but Harriot shouldn't be forgotten!"*

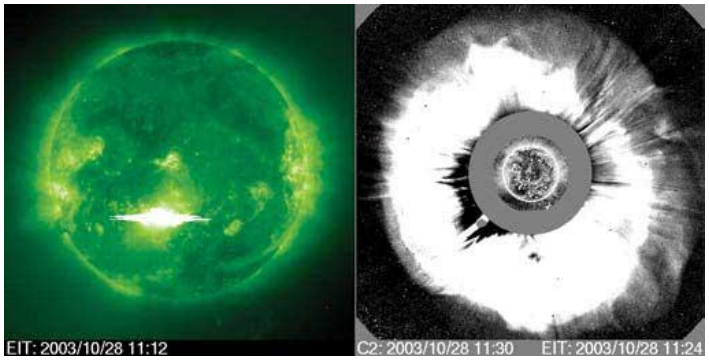
STUDY REVEALS HAZARDS OF SEVERE SPACE WEATHER

A study describes how extreme solar eruptions could have severe consequences for communications, power grids and other technology on Earth. The National Academy of Sciences in Washington conducted the study. The resulting report provides some of the first clear economic data that effectively quantifies today's risk of extreme conditions in space driven by magnetic activity on the sun and disturbances in the near-Earth environment. Instances of extreme space weather are rare and are categorized with other natural hazards that have a low frequency but high consequences.

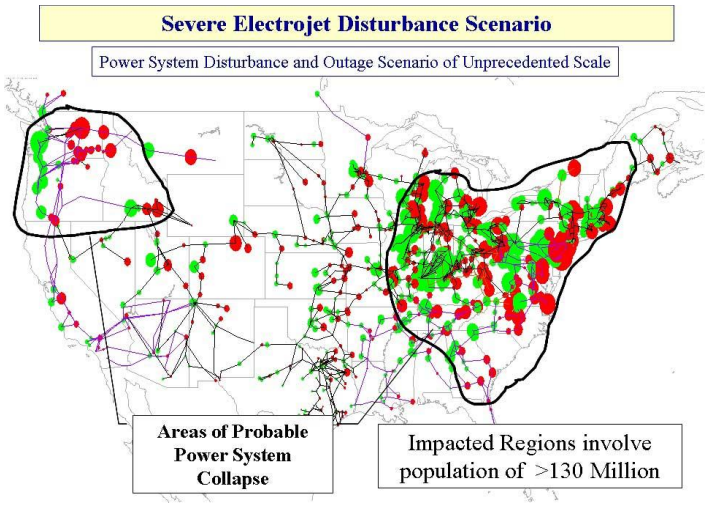
"*Obviously, the sun is Earth's life blood*," said Richard Fisher, director of the Heliophysics division at NASA Headquarters in Washington. "*To mitigate possible public safety issues, it is vital that we better understand extreme space weather events caused by the sun's activity*."

Besides emitting a continuous stream of plasma called the solar wind, the sun periodically releases billions of tons of matter called coronal mass ejections. These immense clouds of material, when directed toward Earth, can cause large magnetic storms in the magnetosphere and upper atmosphere. Such space weather can affect the performance and reliability of space-borne and ground-based technological systems.

Space weather can produce solar storm electromagnetic fields that induce extreme currents in wires, disrupting power lines, causing wide-spread blackouts and affecting communication cables that support the Internet. Severe space weather also produces solar energetic particles and the dislocation of the Earth's radiation belts, which can damage satellites used for commercial communications, global positioning and weather forecasting. Space weather has been recognized as causing problems with new technology since the invention of the telegraph in the 19th century. A catastrophic failure of commercial and government infrastructure in space and on the ground can be mitigated through raising public awareness, improving vulnerable infrastructure and developing advanced forecasting capabilities. Without preventive actions or plans, the trend of increased dependency on modern space-weather sensitive assets could make society more vulnerable in the future.

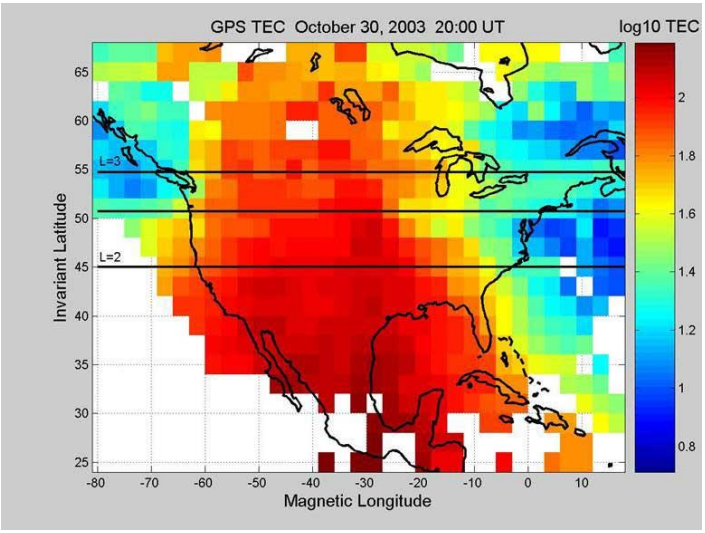


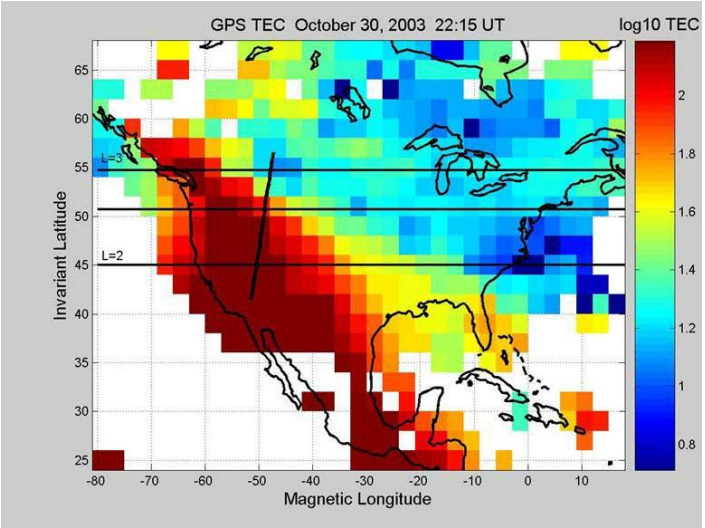
A severe space weather event is likely when an intense flare occurs on the Earth-facing side of the sun. In 2003, this flare (left image) is followed immediately by an enormous interplanetary blast wave (right image) called coronal mass ejection or CME that propagates rapidly away from the sun towards Earth. Depending on severity and nature of the storm, the collision with Earth's magnetic field called a geomagnetic storm can affect satellites, air travel and power grids. Credit: NASA



The image shows a scenario presented by a study participant of extreme space weather that leads to a partial, wide-spread collapse of the U.S. electric power grid with enormous consequences for the affected population. Improvements in space weather forecasting, public awareness and infrastructure preparedness can mitigate the effects. Credit: NASA

NASA requested the study to assess the potential damage from significant space weather during the next 20 years. National and international experts from industry, government and academia participated in the study. The report documents the possibility of a space weather event that has societal effects and causes damage similar to natural disasters on Earth. "*From a public policy perspective, it is quite significant that we have begun the extremely challenging task of assessing space weather impacts in a quantitative way*," said Daniel Baker, chair of the panel that prepared the report. "*Whether it is terrestrial catastrophes or extreme space weather incidents, the results can be devastating to modern societies that depend in a myriad of ways on advanced technological systems*," said Baker. "*We were delighted that NASA helped support bringing together dozens of world experts from industry and government to share their experiences and begin planning of improved public policy strategies*."





The geomagnetic storms' effects can be visualized over the U.S. by showing changes of the electron density in the Earth's outermost atmospheric layers. The before image shows the ionosphere electron density as high over wide parts of the lower 48 states. The after image shows electrons strongly diminished over the central and northeastern parts of the U.S, and increased over the northwest. Extreme, rapid changes in the ionosphere can inflict strong currents in the power grid that may lead to blackouts. Credit: NASA

The sun is currently near the minimum of its 11-year activity cycle. It is expected that solar storms will increase in frequency and intensity toward the next solar maximum, expected to occur around 2012. http://nasascience.nasa.gov/heliophysics http://www.nap.edu/catalog/12507.html

SCIENTISTS FIND ASTEROIDS ARE MISSING, & POSSIBLY WHY

Scientists have uncovered a curious case of missing asteroids. The main asteroid belt is a zone containing millions of rocky objects between the orbits of Mars and Jupiter. The scientists find that there ought to be more asteroids there than researchers observe. The missing asteroids may be evidence of an event that took place about 4 billion years ago, when the solar system's giant planets migrated to their present locations.

David A. Minton and Renu Malhotra say missing asteroids is an important piece of evidence to support an idea that the early solar system underwent a violent episode of giant planet migration that might possibly be responsible for a heavy asteroidal bombardment of the inner planets. Minton and Malhotra began by looking at the distribution of asteroids in the main asteroid belt. Astronomers first discovered a series of gaps in the asteroid belt, now called the Kirkwood gaps, back in the 1860s when only a handful of asteroids were known. The gaps occur at distinct regions of the asteroid belt where Jupiter's and Saturn's gravity strongly perturbs and ejects asteroids. The present-day orbits of Jupiter and Saturn explain why these unstable regions are devoid of asteroids.

"*What we wanted to know was, how much of the structure of the asteroid belt could be explained simply by the gravitational effects of the giant planets, as are the Kirkwood gaps*," Minton said. Minton and Malhotra looked at the distribution of all asteroids with diameters greater than 50 kilometers, or about 30 miles. All asteroids of this size have been found, giving the researchers an observationally complete set for their study. Also, almost all asteroids this large have remained intact since the asteroid belt formed more than 4 billion years ago, a time record spanning all but the very beginning of solar system history.

"*We ran massive sets of simulations with computer planets where we filled up the asteroid belt region with a uniform distribution of computer asteroids*," Minton said. The scientists then had the computers simulate the billions of years of solar system history. Their simulations ultimately ended with far more asteroids remaining than are actually observed in the asteroid belt. When the simulated asteroid belt was compared with the actual asteroid belt, they discovered a peculiar pattern in the differences. The simulated asteroid belt matched the real asteroid belt quite well on the sunward-facing sides of the Kirkwood gaps, but the real asteroid belt seemed to be depleted in asteroids on the Jupiter-facing sides. "*Then we simulated the migration of the giant planets*," Minton said. "*The perturbing effects of the migrating planets sculpted our simulated asteroid belt. After the migration was over, our simulated asteroid belt looked much more like the observed asteroid belt*." "*Our interpretation is that as Jupiter and Saturn migrated, their orbital resonances swept through the asteroid belt, ejecting many more asteroids than is possible with the planets in their current orbits*," Malhotra said. "*And the particular pattern of missing asteroids is characteristic of the pattern of Jupiter's and Saturn's migration*."

"Our work explains why there are fewer asteroids on the Jupiter-facing side of the Kirkwood gaps compared to the sun-facing side," Minton said. "The patterns of depletion are like the footprints of wandering giant planets preserved in the asteroid belt." Their results corroborate other lines of evidence indicating that the giant planets Jupiter, Saturn, Uranus and Neptune formed in a more tightly compacted configuration, and then Jupiter moved slightly closer to the sun, while the other giant planets moved farther apart from each other and farther away from the sun. Minton and Malhotra say that their result has implications for how far and how fast the planets migrated early in solar system history, and the possibility that planet migration perturbed asteroids that may have contributed to a heavy bombardment of the inner solar system.

"*Our result doesn't directly answer the question of whether the timing of this can be tied to inner solar system heavy bombardment - that's open for debate*," Minton said. "*But what it does say is that there was an event that destabilized asteroids over a relatively short period of time." "All the asteroids being kicked out of the asteroid belt had to go somewhere*," he added. "*The implication of this is that when all those asteroids were getting kicked out of the main belt, they could have become projectiles impacting the Earth and the moon, Mars, Venus and Mercury*."

FROM THE EDITOR'S TERMINAL

The Stargazer is <u>your</u> 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
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In February's StarGazer:

The next EAS Meeting is 7:00 P.M. Saturday February 28th at the 'Aurora Astro Products' store location at Silver Lake.