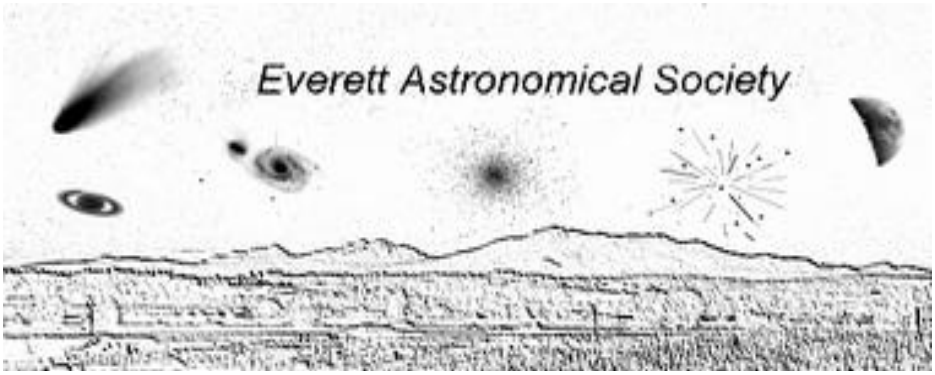
Volume MMX No. 5



The Stargazer

May 2010

President:	Mark Folkerts	(425) 486-9733	folkerts at seanet dot com	***The Stargazer***
Vice President:	<open>		--	**P.O. Box 12746**
Librarian:	Chris Dennis		--	**Everett, WA 98206**
Treasurer:	Jerry Galt		jerryg at genwest dot com	
'Planetarium' column	John Goerger		pos1 at earthlink dot net	
Web assistance:	Cody Gibson		cgibson41 at austin.rr dot com (change 'at' to @, dot to. to send email)	*See EAS website at:* http://everettastro.org

EAS BUSINESS…

EAS MEETING - - SATURDAY MAY 8TH - 3:00 PM, EVERETT EVERGREEN BRANCH LIBRARY

This month's speaker will be EAS Treasurer, Dr. Jerry Galt, who will give a talk on "CCD Astro-Imaging and Calibration," discussing how modern CCD astro-cameras work, and what this means for 'calibrating' (removing noise and defects) and processing (enhancing) the images they capture. The meeting is located at ***Evergreen branch*** of the ***Everett Public Library*** (*not main downtown branch*) located at 9512 Evergreen Way. - Website · Directions

Attending members will be eligible for a monthly door prize.

New Member or Beginners Class with Jack Barnes:

The next class is the 25th of May. They are set for the 4th Tuesday of each month.

★ STAR PARTY INFO ★

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

Tentative Star Parties dates for 2010. *(Note change to Friday nights.)*

May 14 **Jun 11** Jul 9 Aug 6 Sep 10 Oct 8 Nov 5 Dec 3

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 star parties. 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 e-mail list, and then send mail to the mail list at ***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.

Other Western US Star Parties This Season

MAY -

May 4-5 - Farewell Bend Public Star Party, Farewell Bend State Park, Huntington OR - http://www.boiseastro.org

May 9-16 - Texas Star Party (TSP), Prude Ranch, Fort Davis, TX - http://www.texasstarparty.org/

May 13-16 - OAS Camp Delany Star Party, Sun Lakes SP - http://www.olympicastronomicalsociety.org/Documents/Camp%20Delany%20Sign-up%20Form%20Spring%202010.pdf http://www.olympicastronomicalsociety.org

May 15 - OMSI-RCA Planet Parade Star Party, Rooster Rock State Park & Stub Stewart State Park, OR http://www.rca-omsi.org/sp/sp_schedule.htm

May 15 - RCA Prineville Reservoir Star Party, Prineville, OR - http://www.rca-omsi.org/sp/sp_schedule.htm http://www.prinevillereservoirstarparty.org/index.html

May 14-16 - RCA Maupin Dark Sky Star Party, Maupin, OR - http://www.rca-omsi.org/sp/maupin.htm

May 12-16 (Memorial Day) - Annual RTMC Astronomy Expo, Riverside, CA - http://www.rtmcastronomyexpo.org/

May 28-31 - Fire in the Sky – Rocket Launch & Star Party, Mansfield, WA - http://www.fireinthesky.org/ http://www.tas-online.org/escal/popups/escalEV.php?ev=14759&readFile=0&readSQL=1 http://www.tas-online.org/calendar.php

JUNE -

Jun 05 - OMSI-RCA Summer Solstice Star Party, Rooster Rock State Park & Stub Stewart State Park, OR http://www.rca-omsi.org/sp/r_rock.htm http://www.rca-omsi.org/sp/sp_schedule.htm

Jun 12 – RCA White River Canyon star party, Mt. Hood OR. - http://www.rca-omsi.org/sp/whiteriver.htm

Jun 11-12 Craters of the Moon Star Party, Craters of the Moon Nat. Monument, ID - http://www.boiseastro.org/ Contact http://mvastro.org

Jun 5-12 Grand Canyon Star Party (GCSP), On South Rim - http://www.tucsonastronomy.org/gcsp.html

Jun 9-13 - The Rocky Mountain Star Stare (RMSS), 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 19 Bogus Basin Star Party Bogus Basin

tba - Stars Over Yellowstone Star Parties, Madison Campground Amphitheater - http://smasweb.org/

JULY -

Jul 9-11 - Trout Lake Star Party Weekend, Trout Lake WA http://www.rca-omsi.org/sp/sp_schedule.htm http://www.rca-omsi.org/sp/pix/troutlake.pdf

Jul 10-14 - Golden State Star Party (GSSP), Frosty Acres Ranch, Adin, CA **-** http://www.goldenstatestarparty.org/

Jul 15-18, - Mt Bachelor Star Party (MBSP), Sunriver (Bend) OR http://www.mbsp.org/

Jul 16 - MVAS City of Rocks Star Party - Almo ID - contact http://mvastro.org

Jul 16-17 - Ponderosa State Park Public Star Party - Ponderosa State Park, McCall ID http://www.boiseastro.org/

Jul 17 - OMSI Lunar Viewing, Rooster Rock & Stub Stewart St. Parks, OR - http://www.rca-omsi.org/sp/sp_schedule.htm

Jul tba - Lava Hot Springs Star Party 2009, Lava Hot Springs ID - http://ifastro.org/web/index.php

AUGUST -

Aug 4-6 - 19th Annual 'Weekend Under the Stars', Foxpark WY - http://home.bresnan.net/~curranm/wuts.html

Aug 6-8 - RCA Maupin Dark Sky Star Party, Maupin, OR - http://www.rca-omsi.org/sp/maupin.htm

Aug 7 – RCA White River Canyon star party, Mt. Hood OR. - http://www.rca-omsi.org/sp/whiteriver.htm

Aug 7-15 - Mt. Kobau Star Party (MKSP), Mt. Kobau, near Osoyoos BC http://www.mksp.ca/

Aug 12-15 - Table Mt. Star Party (TMSP), Ellensburg WA http://www.tmspa.com/

Aug 11-15 - Oregon Star Party (OSP), Ochocco NF http://www.oregonstarparty.org/

Aug 13-15 - Island Star Party (ISP), Victoria Fish & Game Assoc - Holker Place, Metchosin (near Victoria), BC, CA http://victoria.rasc.ca/events/StarParty/ http://www.starfinders.ca/starparty.htm

Aug 12 - 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

tba - Deception Pass Star Party, Bowman Bay, Deception Pass, WA - http://squakmountain.org/deception_pass_star_party.htm http://squakmountain.org/events.html#upcoming

Aug (Labor Day) - SAS Brooks Memorial Park Star Party, SR 97 near Goldendale - http://www.seattleastro.org/events.shtml

SEPTEMBER -

Sep 3-5 - RCA Maupin Dark Sky Star Party, Maupin, OR - http://www.rca-omsi.org/sp/maupin.htm

Sep 4-11 - Merritt Star Quest - Loon Lake Road - Merritt, BC - http://www.merrittastronomical.com/

Sep 9-11 - Orion Nebula 2010 Star Party, Table Mt. (Ellensburg) WA http://www.seattleastro.org/orionnebsp.shtml

Sep 10-12 - Idaho Star Party, Bruneau Dunes State Park - http://ifastro.org/web/index.php (Boise AS) http://www.boiseastro.org/

Sep 11-12 - **White Sands Star Party**, Alamogordo/White Sands, NM - http://www.zianet.com/wssp/

Sep 10-12 - RCA Dark Sky Camp Weekend, Camp Hancock, OR - http://www.rca-omsi.org/sp/sp_schedule.htm

tba - CalStar, Lake San Antonio Park CA http://www.sjaa.net/calstar/ - http://www.sjaa.net/

Sep 10-11 - Craters of the Moon Star Party, Craters of the Moon Nat. Monument, ID http://ifastro.org/web/index.php http://www.boiseastro.org/

Sep 11-12 - Alberta Star Party, Starland Recreation Area Campground near Drumheller, Alberta, CA http://www.astronomycalgary.com/events/info/155 http://calgary.rasc.ca/asp2010.htm

OCTOBER -

Oct 8-11 - OAS Camp Delany Fall Star Party, Sun Lakes SP - http://www.olympicastronomicalsociety.com/Documents/FALLCAMPDELANYSign-UpForm.pdf

Oct 7-9 - Sun River Star Party, Brothers, OR http://www.rca-omsi.org/sp/sp_schedule.htm

Oct 6-10 - The Enchanted Skies Star Party, Socorro NM - http://enchantedskies.org/

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

NOVEMBER -

Nov 4-7 - Nightfall, Palm Canyon Resort, Borrego Springs, CA http://www.rtmcastronomyexpo.org/nightfall.htm

! Likely cancelled - Night Under the Stars, Alamo Lake, AZ - http://azstateparks.com/Parks/ALLA/events.html (closing due to state budget cuts)

Other Star Parties: http://www.cloudynights.com/ubbthreads/showflat.php/Cat/0/Number/2858373/Main/2858366

2010 ASTRO CALENDAR

May 2010

May 05 - Eta Aquarids Meteor Shower Peak
May 07 - Space Day
May 08 – EAS Meeting – Saturday 3:00 pm Evergreen Branch Library
May 16 - Moon Occults Venus
May 25 – New member / Beginner class with Jack Barnes
May 26 - Mercury at Its Greatest Western (morning) Elongation (25 Degrees)

June 2010

Jun 11 - Asteroid 1 Ceres Occults TYC 6845-00708-1 (11.6 Mag Star)
Jun 12 - New Moon.
Jun 12 – EAS Meeting – Saturday 3:00 pm Evergreen Branch Library
Jun 15 - Asteroid 1 Ceres Closest Approach To Earth (1.825 AU)
Jun 20 - Asteroid 1 Ceres Occults TYC 6832-00337-1 (11.3 Mag Star)
Jun 21 - Summer Solstice, 11:28 UT
Jun 25 - Pluto at Opposition
Jun 26 - Partial Lunar Eclipse

July 2010

Jul 06 - Earth At Aphelion (1.017 AU From Sun)
Jul 11 - Total Solar Eclipse, Visible in South Pacific, Chile
Jul tba - EAS Meeting
Jul 29 - South Delta-Aquarids Meteor Shower Peak

August 2010

Aug 01 - Alpha Capricornids Meteor Shower Peak
Aug 05 - Neil Armstrong's 80th Birthday (1930)
Aug 06 - Southern Iota Aquarids Meteor Shower Peak
Aug 07 - Mercury At Its Greatest Eastern (evening) Elongation (27 Deg)
Aug 09 - New Moon
Aug tba – EAS Meeting – location tba

Aug 12 - Perseids Meteor Shower Peak
Aug 20 - Venus at Its Greatest Eastern (evening) Elongation (46 Deg)
Aug 20 - Neptune at Opposition
Aug 25 - Northern Iota Aquarids Meteor Shower Peak

September 2010

Sep 14 - John Dobson's 95th Birthday (1915)
Sep 19 - Mercury At Its Greatest Western (morning) Elongation (18 Deg)
Sep 21 - Jupiter at Opposition
Sep tba – EAS Meeting
Sep 21 - Uranus at Opposition
Sep 23 - Autumnal Equinox (03:09 UT)

October 2010

Oct 09 - Draconids Meteor Shower Peak
Oct 16 – Astronomy Day (Autumn)
Oct 17 - New Horizons, Halfway to Pluto
Oct tba – EAS Meeting
Oct 21 - Orionids Meteor Shower Peak
Oct 31 - Michael Collins' 80th Birthday (1930)

November 2010

Nov 01 - Daylight Savings - Set Clock Back 1 Hour (USA)
Nov 03 - Taurids Meteor Shower Peak
Nov 05 - Moon Occults Venus
Nov tba – EAS Meeting
Nov 17 - Leonids Meteor Shower Peak
Nov 25 - Asteroid 2002 KL3 Near-Venus Flyby (0.03 AU)

December 2010

Dec 06 - Moon Occults Mars
Dec 13 - Geminids Meteor Shower Peak
Dec 21 - Total Lunar Eclipse
Dec tba - EAS Holiday Meeting
Dec 21 - Winter Solstice, 23:38 UTC
Dec 22 - Ursids Meteor Shower Peak

OBSERVER'S INFORMATION…

LUNAR FACTS

May 06	Last Quarter Moon
May 14	New Moon
May 20	First Quarter Moon
May 27	Full Moon
Jun 04	Last Quarter Moon
Jun 12	New Moon
Jun 19	First Quarter Moon
Jun 26	Full Moon
Jul 04	Last Quarter Moon
Jul 11	New Moon
Jul 18	First Quarter Moon
Jul 26	Full Moon

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

Object	*Rises*	*Sets*	*Con*	*Diam.*	*Mag*
Sun	***05:43 am***	***20:30***	***Ari***	***30'***	***-27.5***
Mercury	**05:21 am**	**19:05**	**Ari**	**11"**	**+2.8**
Venus	**07:03 am**	**23:03**	**Tau**	**12"**	**-3.9**
Mars	**11:53 am**	**02:49 am**	**Can**	**7"**	**+0.8**
Jupiter	**04:02 am**	**15:41**	**Psc**	**36"**	**-2.1**
Saturn	**15:48**	**04:23 am**	**Vir**	**19"**	**+0.8**
Uranus	**04:08 am**	**16:04**	**Psc**	**03"**	**+5.9**
Neptune	**03:04 am**	**13:18**	**Aqr**	**02"**	**+7.9**
Pluto	**23:48**	**09:09 am**	**Sag**	*****	**+14.0**

(*times listed are in local time for Everett PDT*)

UW Astronomy Speakers Colloquium Schedule

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

'IT'S OVER YOUR HEAD' – ASTRONOMY PODCASTS

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

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

EAS MEMBER NEWS

$$ - FINANCIAL HEALTH - $$

The club currently maintains a $425+ balance. This month we paid our annual insurance bill. We try to keep approximately a $500 balance level to allow for contingencies.

CLUB SCOPES

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

A 25-INCH MIRROR HAS BEEN DONATED TO THE CLUB, AND INVESTIGATION IS UNDER WAY TO DETERMINE WHAT WOULD BE REQUIRED TO TURN IT INTO A LARGE CLUB TELESCOPE. IF YOU HAVE INTEREST OR SKILLS IN MIRROR TESTING OR TELESCOPE MAKING, PLEASE LET US KNOW.

EAS members: contact Ron Tam to borrow a scope for up to 60 days.

OFFICES STILL VACANT FOR 2010 -

President: Schedule & run the club monthly meetings.

Vice president: Run monthly meetings if President is absent, and store/loan club telescopes.

Newsletter Co-editor #2: Contribute columns or articles for the StarGazer on a regular basis.

Publicity chairperson: Contact news media, and e-mail and blog to raise public awareness of EAS activities.

Outreach chairperson: 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. A star party night can be a rewarding event for all involved. **Please email Mark Folkerts with your interest (or suggestions).**

Sidewalk astronomy committee: 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.

EAS MEMBERSHIP BENEFITS & INFORMATION

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

Magazine Discounts –

In addition you will be able subscribe to ***Sky and Telescope*** for $7 off the normal subscription rate, contact the treasurer (Jerry Galt) 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 Jerry Galt will renew your *Sky and Telescope* subscription for you. **Astronomy** magazine offers a similar opportunity to club members.)

Membership in the Astronomical League -

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

EAS Club Telescope Borrowing -

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

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

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

EAS Library -

Membership will give you access to all the material in the lending library. The library, consists of VCR tapes, DVDs, many books, magazines, and software titles. The EAS has a library of books, videotapes, and software for members to borrow, **located at Aurora Astro Products store**. We always value any items you would like to donate to this library. You can contact club librarian to borrow or donate any materials. See library items 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

>> Members – please check 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. <<

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

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

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

"Mention your EAS club membership at Jim Bielaga's astronomy store 'Aurora Astro Products' and receive a 10% discount on all purchases. This is an exclusive discount to current E.A.S. members only. I am proud to be able to offer this discount to Everett club members, and thanks for the support you have shown me on opening my new store. Also I have made great friends and learned a lot being a club member since 1991.

- Clear Skies, Jim Bielaga"

Aurora Astro Products
"*Your Northern Light in the Astronomy Business*"
11419 19th Avenue SE #A102
Everett, WA 98208
www.auroraastro.com
425-337-4384
425-337-4758 fax
Hours:
Monday, Thursday, Friday – 9:00 am to 6:00 pm
Tuesday/Wednesday – Noon to 6:00 pm
Saturday – 10:00 am to 5:00 pm

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

[The EAS welcomes newsletter article contributions and submissions of all types from its members.]

In EAS StarGazer - "The Planetarium"

(for Late May 2010 to Mid June 2010)

- By John W Goerger - pos1@earthlink.net

By the 10th, of May the Moon was New with multi-colored stars twinkling in the inky blue-velvet of the predawn sky with just the faintest hint of a reddish-orange glow over in the eastern part of the sky. The constellations of Lyra, Cygnus and Aquila were clearly visible, along with the planet Saturn. For many folks the stars were thought of as eternal and unchanging, yet there were some who suspected there was more to stars then most fellow citizens thought or believed at the

time. The weather was crisp, with a firm breeze blowing from the West toward the East. It had been raining the night before, but the rain had stopped. The evidence was the frozen water that was on the ground and laying on some of the equipment and tools.

The year, as you can guess, is not 2010 but 141 years ago; 1869 to be precise in a location called Promontory Point, Utah. At this date, and location the World's First Transcontinental Railroad was to be completed. Later in the day, the Golden Spike would be hammered in linking the Western and Eastern United States of America---this Nation wedded in iron! In 1869 believe it or not there were no astronomy observatories out west! There might have been a few people who had a small 2 to 3 inch refractor and given the cost of telescopes and the scant wages most people made then, there probably weren't a lot of privately owned telescopes out west (think of Marty, Doc and his soon-to-be-bride in BACK TO THE FUTURE 3—she had a telescope that she needed Doc to fix).

The Lick Observatory, the First American Astronomy Observatory out West was founded in 1888. It was the Second Largest Telescope, in the world, at the time; a 36-inch refractor; the Largest Refractor (and still is) is, the40-inch located in Chicago Ill. What transportation system did they use to transport the 36-inch lens out west? It was the Railroad system, with the locomotives, transporting the critical lens and equipment necessary for the building of the Lick Observatory. Twenty years ago this year, the world saw the First and Largest telescope ever orbit the earth and changed forever our views, beliefs and wonder of the Universe---the HUBBLE SPACE TELESCOPE---a 94-inch mirror! For some, you may not realize that the only way HUBBLE could be taken into space was by the Space Shuttles! Not only that, the HUBBLE was designed to be worked on by returning astronauts who would go into space onboard a Space Shuttle! The company that builds the SRBs (Shuttle Rocket Boosters), they are the two side boosters that are mated to the external fuel tank of the space shuttles, well guess where that company is located? Eight miles from Promontory Point Utah!

This coming July 20th 2010 will mark the 41st, Anniversary of the First Manned Landing upon that yellow-whitish orb that circles our home-world---the Moon. Think what it might have been like at Promontory Point when the JUPITER and Engine 119 where there, facing each other (you all have seen pictures in books about the event, with those two locomotives) and think, if someone there at the time, might have said the following; "In one-hundred years or so, I think they will land a man on the moon". If that had happened, how many laughed at the person, but also how many might have agreed with that person as well? Interesting to think about, isn't it? There were people thinking about such an event happening; Jules Verne's book "*From The Earth to the Moon"*, about 3 men from Earth going to the moon, was published in 1865 with a follow-up story entitled *"Around the Moon"*. Both books were combined later with the title; *"A Trip to the Moon and Around It"*.

One hundred years, two months, a week or so, and sprinkle in a few days is all that separates those two awe-inspiring human events---the FIRST TRANSCONTINENTAL RAILROAD and APOLLO 11! There were people who were born in 1869 and lived to see human beings travel and walk on the celestial sphere which has been earth's companion for the last 4.6 billion years! Now we have a President and a NASA Director who are telling us, that the moon is not a destination for us?

A place, President Obama has said; "well been there, haven't we"? Oh really? How many others have been saying the same thing? Well, some of the leaders of the Planetary Society, Bill Nye the "Science Guy" to name a few, have stated the moon is so; "been there; done that". They go on and tell us the "younger folks" are not interested in the moon! Have any of them gone out with a telescope and looked at the moon? I guess they do not know that the moon is the size of Africa and Australia in total surface area! What would you think, given the following information; landing a total of 6 folks; 3 in Africa and 3 in Australia would constitute the statement; "Been there; done that"? Nope, I agree with you, it doesn't, by a long shot!

The main question(s) and statements which are being said by those who oppose the United States returning to Lunar Frontier are along the topic(s) of saying that there really isn't anything useful on the moon. Why bother? It, isn't exciting, no purpose! Given their statements and reaction it makes a person think that these folks are not operating with a Full Deck. They must not be reading and hearing the newest data being discussed about the vast quantities of Rare-Earth-Elements and water located within craters and other lunar regions. Actually, the knowledge of massive quantities of Rare-Earth-Elements were discovered when the crews of Apollo returned their treasures they had collected and the geologists, chemists and related fields started examining and testing the rocks and soil of our satellite. Yet, much of this information was not discussed in astronomy classrooms and even worst much of the American Public were being told by the media there wasn't much of anything, of any interest discovered with the Apollo missions, other than a more specific age of our solar system.

Yet, the information was there, if a person took the time to look for it. Around 1976 a book called *THE MOON BOOK* written by Bevan French who is Planetary Geologist. In it, he discussed some of the amazing knowledge about the moon, such as its history, geology and the vast amounts of minerals and elements that made up the moon. As of the writing of this column it is being reported that data gathered from a NASA radar experiment which was onboard India's Chandrayaan 1 Lunar Orbiter has evidence that there is water ice in more than 40 small craters located near the moon's North Pole. Indications are, there may be upwards of 600 million tons of ice within those craters! If you have been following the reports concerning water-ice locations on the moon, there are more and more and more regions where the water is located. It has also been learned that the moon is creating water on a daily basis and investigations are ongoing as to how this process occurs.

So, what should be NASA and America's approach to space exploration be? First off, we need to start using the knowledge we are obtaining, and then turn that information into utilization of data for our benefit and our civilization. We need to send more robotic missions to the moon and vehicles which would transverse large lunar regions, and look for and detect the largest regions that have the most material wealth and ice-water supplies. From there, follow-up missions would be robotic collection return missions of lunar material back to earth for further study. While this is going on a continued development of human-rated rockets and space vehicles for a series of human missions for extended periods of time, on the moon. A suggestion of the time astronauts would be on the lunar surface would be at least 14-days, with missions, depending on what would be discovered and learned, every three months, or sooner. Then, as we get a clearer understanding, regarding the safety of the astronaut crews and other aspects of the missions, the mission's stays could be either twice the previous mission times or three times them.

Given the radiation hazards the astronauts could be exposed to, as soon as possible, ways of living under the lunar soil would be given top priority. Depending upon the safety requirements, that data would tell us the depth at which moon bases would be located. Everything is all interconnected because another major quest is using the material on

the moon to build and create things with, just as we do on earth. Such as the mining, smelting of lunar ores and minerals, and also developing of growing and cultivating plants which we humans need to eat and flowers from which we gain pleasure looking at and smelling their sweet fragrances. There is also the need for companionship. Not the kind we get from being around another human being but from our pets; dogs, cats, fish, all the creatures we enjoy having and caring for, we will need them with us in our lunar settlements. They would also serve as another safety back-up systems, much the same way as canaries were used in the coal mines of one hundred years ago. Here on earth it has been learned these animals can detect problems even before our most sophisticated detectors can find and alert us. In the area of Drug Detection and illegal food stuffs being brought into various countries, dogs are used extensively over human-made equipment, in finding and alerting its human handlers. Then there are the other needs---our families. Yep, mom and dad and the kids, they will living in the space habitats and learning the ways of pioneering a new and endless human frontier---Space itself.

This all leads to a topic I have mentioned in my previous columns---THE HUMANIZATION OF SPACE. In an earlier column I mentioned how crucial it was to understand solar and lunar eclipses and the relationship to how accurate human maps where of the land masses on Earth. For the folks of the 1800s' and previous centuries before them, astronomy and the knowledge it gave them, about how to tell the seasons, to know where they were and how to get to another location were all related to this knowledge they had of the cosmos. Same for us; our plan for Space is it is a place for humanity to grow and expand! There will be more to follow in my upcoming columns discussing the reasons that humanity must move into the cosmos; a logical, reasoned, economic, and environmental reasons for humanity to expand beyond its home-world. In 1903, the same year the Wright Brothers flew the First Gas-powered manned airplane, in Russia, Konstantin Tsiolkovsky published how a rocket engine would work in space---not a jet engine but a rocket engine and the design of such a vehicle. He is he the person who is credited with the following statement; "*The Earth is the Cradle of Humankind; but Humanity Cannot Remain in the Cradle Forever"*.

I have always supported private industry and its ability to create and be innovative and in many ways beyond any Government or Government Agency can do. One thing that was stated by President Obama which I agree with is that government-based funds are to assist private industries with the creation of human-rated space vehicles and the vessels needed to loft them off the planet. When this Nation began in earnest of constructing the Transcontinental Railroad, Government monies (think our money) was invested and in some aspects given to those companies involved with that grand venture. When America decided to build the Panama Canal, it was totally paid for by U.S. funds (yep, your money and mine) but look at the return on our investment! This nation and private industries made Trillions of Dollars off of that creation. For us, the American Taxpayer, there are also the lower costs of goods and services that we benefited from.

In the early 1980s' there was a plan to invest, using funding from private industries to buy one of the Space Shuttles and to take over all marketing of the Space Shuttle System! The Administrator then was Mr. Jim M Biggs of NASA and he was all for it. The White House with President Reagan at the time was suggesting we need to look into the "privatization of space" and here was a golden opportunity for our reaching into the cosmos to be shared with private industries. The organization was offering 300 million dollars as a down payment for one of the Space Shuttles. The total cost would be around $1.5 billion and, as stated, they would take over all marketing of the Space Shuttles. This would free up funds which NASA would have had to use to look for users, but now could apply those funds to other sectors of NASA! Then out-of-the-blue, the head of OMB (Office of Management and Budget) which is under the White House nixed the whole idea. A guy named Stockman was in charge of OMB then, and flat out refused to allow NASA to work with private industry on this deal!

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Guess what? About a week or so ago, the stupid rain clouds parted about an hour or so after sunset and my wife and I saw the planet Venus right where it is suppose to be! Here in the Pacific Northwest the rain clouds think this is the only place to "hang out' here on Earth! Rain clouds are SO STUPID! Oh well, now that summer is right-around-the corner, hopefully we will get some telescope time to ponder the mysteries of the Universe, but since summer is close at hand that means less nighttime to stargaze but, oh well we get what we get! Anytime a person can and look though an eyepiece or binoculars and gaze skyward into vast vista of countless stars, nebulas and glistening galaxies quite a bit of the problems we have in our everyday lives, disappear for a few hours and hopefully some of the problems we face do fade forever.

For what is happening in the evening sky in May 2010 check out The Planetarium in last month's THE STARGAZER as I discussed most of what is visible, as far as the planets location to each other in our evening springtime sky. Here I will mention what is going on toward the end of May and part of June night sky we can experience. **VENUS** is stunning at a visual -3.9 over in the west after sunset. This radiant spectacle is over 20 degrees in altitude and is sure to please those who observe it. The amount it will be illuminated by the sun will decrease a bit from the 86% it was on May 15th, to 76% by June 15th. However its brightness will increase to a -4.0 in June and its angular size will be 14 arc seconds (14") also by the 15th of June. It will look really neat when you peer at it with a telescope.

MARS had an apparent magnitude of +0.7 on the 1st of May but by the 31st, it will dropped to a visual +1.1 and remember for every full magnitude decrease number, the brightness of a celestial object has actually decreased by 2.512 times fainter. To make out any possible patterns on Mars surface will require a telescope of 12 inches, at least. By June 15th the angular size of Mars will be 5.6 arc seconds (5.6"). By the 6th of June it will be near (line-of-sight) the star Regulus and check out and see if you can see a difference between the two of them in brightness. Also, with the angular size so small no features can be detected and would require the super big giant Newtonian scopes of such size, well it just isn't worth the trouble now.

SATURN is fairly high in the sky toward the end of May with a visual 0.9 by the 15th of May. If the night sky is clear swing your scope toward this ring-world (of course all the "Jovian Planets" have rings, it's just Saturn with its rings that you can see from Earth, visually---with a telescope). The planet has decreased a bit in brightness, to a +1.1 by the 15th of June. According to my sources it will be 2 degrees from a star in the constellation of Virgo, a 4th magnitude star called Beta Virginis and Saturn, even though it has dropped a bit in brightness is 10 times brighter than the mentioned star. This world is always worthy of a telescope aimed at it, no matter what you are searching for in the star-filled night sky.

NEPTUNE rises after 2 AM Local Daylight Time (LDT) as I mentioned in last months' The Planetarium, in mid-May and has a visual of 7.9. By morning twilight it is about 20 degrees in altitude. By early June wait

until around 3 AM if you desire getting up that early, or staying up that late to aim your telescope at this dim boring planet. Oh by-the-way it still is at a 7.9 so either use a goto telescope or a good set of astronomy charts to find this one!

PLUTO is around but why bother? Even if you did aim your scope at it, even with a 14-inch scope you would need to do a sketch of what you are seeing in your eyepiece and then do the same thing the next predawn morning (3 AM) and then try and determine if any of the little dots you sketched, moved! Yes, I am of the group that thinks Pluto should be given back its title of "planet", but in so doing, than that other weird object that is more than twice the distance Pluto is should also be considered a planet! Why Not! More the Merrier! Oh one-more-thing; the brightness of Pluto? 14th Magnitude, good luck, you will need it if you have this burning desire to stare into the stellar abyss and wondering if you are seeing what you think you are seeing!

JUPITER rises, in the east about 2-3 AM toward the end of May. It is a visual -2.3 and its angular diameter is increasing to about 38 arc seconds (38"). Nearby it is the planet **URANUS** and is in the brightness range of 5.9. There is something going on between these two (no they are not "dating"---if you are beginning to think that you have stayed up way to late and need to get some sleep) and with binoculars you can see what it is. You should be able to see both of them in the same field of view! Way cool! They are within only 1 degree from each other. It is close to the end of May when you should try locating them and peering at them with your really cool binoculars. Of course when you do this, you now have a good idea where Uranus is, so after you get your bearings, swing your telescope and enjoy observing this aqua-blue globe in the early predawn sky! In the beginning of June you will still get to watch them and by the 6th of June Uranus is only 28 arc seconds (28") due north of Jupiter! So, for many telescopes you will be able to see both of them in the same eyepiece under low magnification! That is a real cool astronomical treat!

Wake up the neighborhood and have them look though the telescope (on second thought that might not be a good idea, as some folks like to sleep more than they are awake and you wouldn't want them to do anything mean to your telescope now, would you?) The diameter of Uranus at this time will be 3.5 arc seconds. Also, as the two planets are close (line-of-sight) try increasing the magnification of your telescope and write down what you see. Another idea is to get a set of colored pencils and maybe draw some color sketches of what the two look like though your telescope. If you do that note the date, the type and diameter of your astronomical instrument (telescope) the type and magnification of the eyepieces, focal length and the "f' number of your scope. Additionally, mention what you think the temperature; any wind and how clear or unclear is the sky; the "seeing conditions" and also any wind and its estimated speed. If windy, the viewing would decrease considerably.

MERCURY reaches its Greatest Western Elongation (west of the sun) by the 25/26 of May with it being 25 degrees from the sun, before sunrise in the East. Because of its orbit most of this angle is along the horizon so its actual altitude with respect to the eastern horizon it will be only 5 degrees. Also, it will be at that height only 30 minutes before sunrise. So, this means you need a clean flat horizon to watch this speed demon of the planets, as far as it takes it to go around the sun (its orbit). Generally speaking, within 88 earth days, Mercury makes one entire orbit about the sun. Its visual is small; 0.4 and its angular size as well; 8 arc seconds (8"). If you can aim a telescope at it, about 39% of the planet is lit. From June 1st to the 10th, it does increase in brightness to a visual -0.6; not bad! By the 10th, Mercury will be rising 50 minutes before the sun and near a waning crescent moon, about 8 degrees below it.

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Coming up in next month's 'The Planetarium' is information that a Partial Lunar Eclipse will be coming our way in the really, really, really, (around 2:30AM) predawn sky of the 26th of June, a Saturday! Also the Sumner Solstice is coming in June! Well that is all for now; AD ASTA---TO THE STARS! Email me if you have any comments, ideas, complaints or just feel like chatting! ! **AD ASTRA! KEEP LOOKING UP!** (but don't trip while you're doing it).

– *John Goerger*

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

HERSCHEL SHOWS RIPENING STARS NEAR ROSETTE NEBULA

The Herschel Space Observatory has uncovered a cosmic garden of budding stars, each expected to grow to 10 times the mass of our sun. It was taken using infrared light by Herschel, a European Space Agency mission with important NASA participation. "*Herschel can see through cold thickets of dust to where big, baby stars are forming*," said Paul Goldsmith, the NASA project scientist for the mission. The image shows most of the cloud associated with the Rosette nebula, located about 5,000 light-years from Earth in the constellation Monoceros, the Unicorn. The region contains a family of growing stars, with the oldest and most massive members in the center of the nebula, and younger and less massive generations located farther out in the associated cloud. The nebula's cluster of the most massive stars, located beyond the right edge of the picture, is responsible for hollowing out the cavity. There's enough dust and gas in the entire Rosette cloud to make about 10,000 suns.

This image shows most the cloud associated with the Rosette nebula, a stellar nursery about 5,000 light-years from Earth in the Monoceros, or Unicorn, constellation. Herschel collects the infrared light given out by dust. The bright smudges are dusty cocoons containing massive embryonic stars, which will grow up to 10 times the mass of our sun. The small spots near the center of the image are lower mass stellar embryos. The Rosette nebula itself, and its massive cluster of stars, is located to the right of the picture. This image is a three-color composite showing infrared wavelengths of 70 microns (blue), 160 microns (green), and 250 microns (red). It was made with observations from Herschel's Photoconductor Array Camera and Spectrometer and the Spectral and Photometric Imaging Receiver instruments. Image Credit: ESA and the PACS, SPIRE & HSC consortia, F. Motte (AIM Saclay,CEA/IRFU - CNRS/INSU - U.ParisDidedrot) for the HOBYS key program

The large, embryonic stars uncovered by Herschel are thought to be a younger generation. They are located inside the tips of pillars that appear to branch out from thicker cloud material. The pillars were, in fact, excavated by the nebula's massive star cluster. Winds and radiation from those stars pushed less dense material away from the pillars, and probably triggered the birth of the big stars inside the finger-like structures. In fact, the pillars point to the location of the massive nebula stars.

The intermediate-mass stellar embryos, each a couple of times as massive as the sun, are located in the redder regions of the image. The small spots near the center of the image are lower-mass embryonic stars, similar in mass to the sun.

Astronomers study regions like the Rosette not only to learn how stars form in our Milky Way, but also to get a better idea of what's going on in distant galaxies. When astronomers look at faraway galaxies, they are seeing light from regions that are bursting with massive stars. In order to compare our galaxy to distant ones, it is therefore important to understand high-mass star formation.

Herschel collects the infrared light from dust. The infrared light is color-coded as follows: light with a wavelength of 70 microns is blue; 160-micron light is green; and 250-micron light is red. The observations were made with Herschel's Photoconductor Array Camera and Spectrometer and the Spectral and Photometric Imaging Receiver instruments. http://www.herschel.caltech.edu http://www.jpl.nasa.gov/news/news.cfm?release=2010-122&cid=release_2010-122 http://www.esa.int/SPECIALS/Herschel/index.html

Einstein's Theory Fights off Challengers Yet Again

Two new and independent studies have put Einstein's General Theory of Relativity to the test like never before. These results, made using Chandra X-ray Observatory, show Einstein's theory is still the best game in town. Each team of scientists took advantage of extensive Chandra observations of galaxy clusters, the largest objects in the Universe bound together by gravity. One result undercuts a rival gravity model to General Relativity, while the other shows that Einstein's theory works over a vast range of times and distances across the cosmos. The first finding significantly weakens a competitor to General Relativity known as "f(R) gravity".

"*If General Relativity were the heavyweight boxing champion, this other theory was hoping to be the upstart contender*," said Fabian Schmidt, who led the study. "*Our work shows that the chances of its upsetting the champ are very slim*."

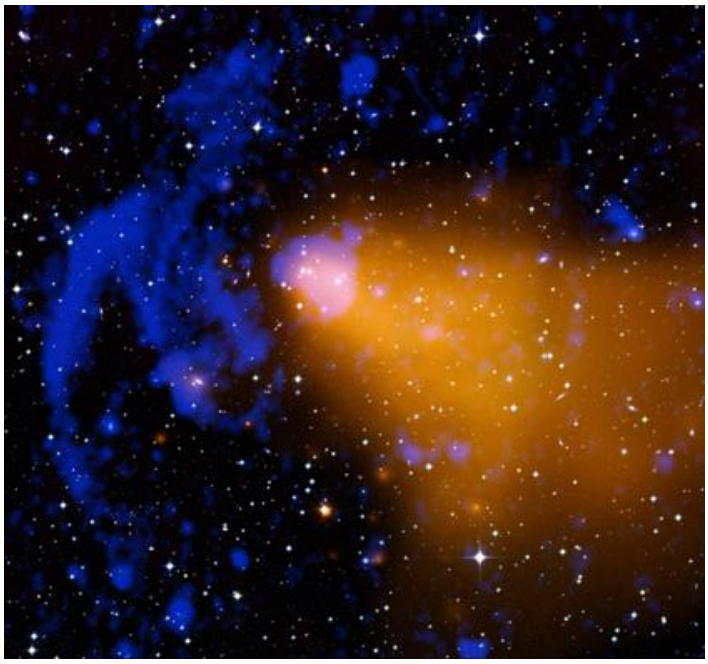
In recent years, physicists have turned their attention to competing theories to General Relativity as a possible explanation for the accelerated expansion of the universe. Currently, the most popular explanation for the acceleration is the so-called cosmological constant, which can be understood as energy that exists in empty space. This energy is referred to as dark energy to emphasize that it cannot be directly detected.

In the f(R) theory, the cosmic acceleration comes not from an exotic form of energy but from a modification of the gravitational force. The modified force also affects the rate at which small enhancements of matter can grow over the eons to become massive clusters of galaxies, opening up the possibility of a sensitive test of the theory.

Schmidt and colleagues used mass estimates of 49 galaxy clusters in the local universe from Chandra observations, and compared them with theoretical model predictions and studies of supernovas, the cosmic microwave background, and the large-scale distribution of galaxies.

They found no evidence that gravity is different from General Relativity on scales larger than 130 million light years. This limit corresponds to a hundred-fold improvement on the bounds of the modified gravitational force's range that can be set without using the cluster data.

"*This is the strongest ever constraint set on an alternative to General Relativity on such large distance scales*," said Schmidt. "*Our results show that we can probe gravity stringently on cosmological scales by using observations of galaxy clusters*."



This composite image of the galaxy cluster Abell 3376 shows X-ray data from the Chandra X-ray Observatory and the ROSAT telescope in gold, an optical image from the Digitized Sky Survey in red, green and blue, and a radio image from the VLA in blue. The "bullet-like" appearance of the X-ray data is caused by a merger, as material flows into the galaxy cluster from the right side. The giant radio arcs on the left side of the image may be caused by shock waves generated by this merger. Credit: X-ray (NASA/CXC/SAO/A. Vikhlinin; ROSAT), Optical (DSS), Radio (NSF/NRAO/VLA/IUCAA/J.Bagchi)

The reason for this dramatic improvement in constraints can be traced to the greatly enhanced gravitational forces acting in clusters as opposed to the universal background expansion of the universe. The cluster-growth technique also promises to be a good probe of other modified gravity scenarios, such as models motivated by higher-dimensional theories and string theory.

A second, independent study also bolsters General Relativity by directly testing it across cosmological distances and times. Up until now, General Relativity had been verified only using experiments from laboratory to Solar System scales, leaving the door open to the possibility that General Relativity breaks down on much larger scales. To probe this question, a group at Stanford compared Chandra observations of how rapidly galaxy clusters have grown over time to the predictions of General Relativity. The result is nearly complete agreement between observation and theory.

"*Einstein's theory succeeds again, this time in calculating how many massive clusters have formed under gravity's pull over the last five billion years*," said David Rapetti, who led the new study. "*Excitingly and reassuringly, our results are the most robust consistency test of General Relativity yet carried out on cosmological scales*."

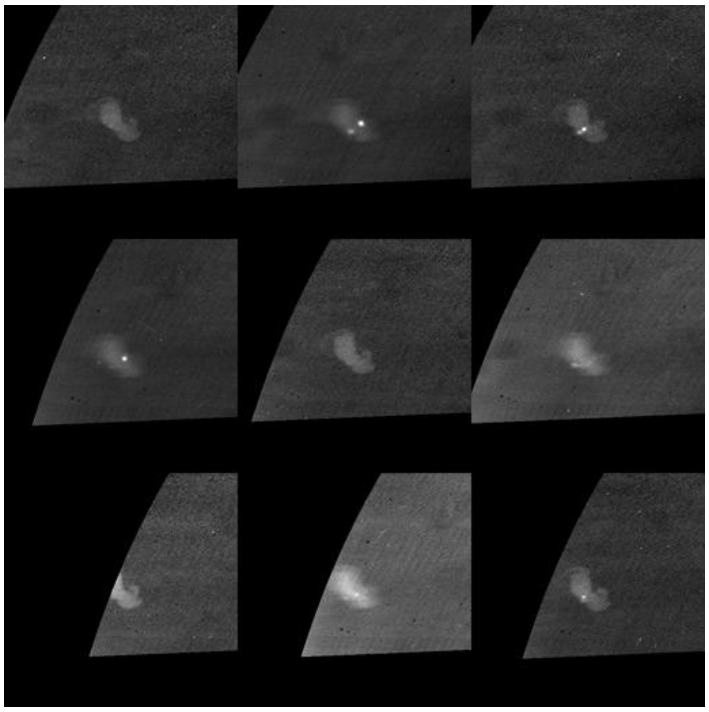
Rapetti and his colleagues based their results on a sample of 238 clusters detected across the whole sky by the now-defunct ROSAT X-ray telescope. These data were enhanced by detailed mass measurements for 71 distant clusters using Chandra, and 23 relatively nearby clusters using ROSAT, and combined with studies of supernovas, the cosmic microwave background, the distribution of galaxies and distance estimates to galaxy clusters.

Galaxy clusters are important objects in the quest to understand the Universe as a whole. Because the observations of the masses of galaxy clusters are directly sensitive to the properties of gravity, they provide crucial information. Other techniques such as observations of supernovas or the distribution of galaxies measure cosmic distances, which depend only on the expansion rate of the universe. In contrast, the cluster technique used by Rapetti and his colleagues measure in addition the growth rate of the cosmic structure, as driven by gravity.

"*Cosmic acceleration represents a great challenge to our modern understanding of physics*," said Rapetti's co-author Adam Mantz. "*Measurements of acceleration have highlighted how little we know about gravity at cosmic scales, but we're now starting to push back our ignorance*." http://chandra.harvard.edu and http://chandra.nasa.gov

FLASH: CASSINI SEES LIGHTNING ON SATURN

The Cassini spacecraft has captured images of lightning on Saturn. The images have allowed scientists to create the first movie showing lightning flashing on another planet. After waiting years for Saturn to dim enough for the spacecraft's cameras to detect bursts of light, scientists were able to create the movie, complete with a soundtrack that features the crackle of radio waves emitted when lightning bolts struck.



"*This is the first time we have the visible lightning flash together with the radio data*," said Georg Fischer, a radio and plasma wave science team associate. "*Now that the radio and visible light data line up, we know for sure we are seeing powerful lightning storms*."

The movie and radio data suggest extremely powerful storms with lightning that flashes as brightly as the brightest super-bolts on Earth, according to Andrew Ingersoll, a Cassini imaging science subsystem team member. "*What's interesting is that the storms are as powerful -- or even more powerful -- at Saturn as on Earth*," said Ingersoll. "*But they occur much less frequently, with usually only one happening on the planet at any given time, though it can last for months*."

The first images of the lightning were captured in August 2009, during a storm that churned from January to October 2009 and lasted longer than any other observed lightning storm in the solar system. To make a video, scientists needed more pictures with brighter lightning and strong radio signals. Data were collected during a shorter subsequent storm, which occurred from November through mid-December 2009. The frames in the video were obtained over 16 minutes on Nov. 30, 2009. The flashes lasted less than one second. The images show a cloud as long as 3,000 kilometers (1,900 miles) across and regions illuminated by lightning flashes about 300 kilometers (190 miles) in diameter. Scientists use the width of the flashes to gauge the depth of the lightning below the cloud tops.

When lightning strikes on Earth and on Saturn, it emits radio waves at a frequency that can cause static on an AM radio. The sounds in the video approximate that static sound, based on Saturn electrostatic discharge signals detected by Cassini's radio and plasma wave science instrument.

Cassini, launched in 1997, and the Voyager mission, launched in 1977, had previously captured radio emissions from storms on Saturn. A belt around the planet where Cassini has detected radio emissions and bright, convective clouds earned the nickname "storm alley." Cassini's cameras, however, had been unable to get pictures of lightning flashing. Since Cassini's arrival at Saturn in 2004, it has been difficult to see the lightning because the planet is very bright and reflective. Sunlight shining off Saturn's enormous rings made even the night side of Saturn brighter than a full-moon night on Earth. Equinox, the period around August 2009 when the sun shone directly over the planet's equator, finally brought the needed darkness. During equinox, the sun lit the rings edge-on only and left the bulk of the rings in shadow.

Seeing lightning was another highlight of the equinox period, which already enabled scientists to see clumps in the rings as high as the Rocky Mountains.

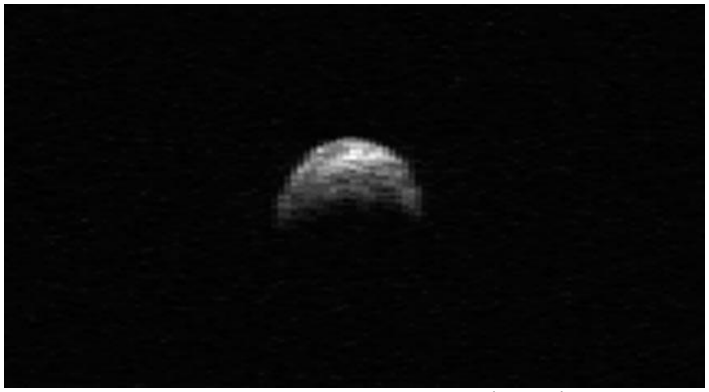
"*The visible-light images tell us a lot about the lightning*," said Ulyana Dyudina, a Cassini imaging team associate, who was the first to see the flashes. "*Now we can begin to measure how powerful these storms are, where they form in the cloud layer and how the optical intensity relates to the total energy of the thunderstorms*." http://www.jpl.nasa.gov/news/news.cfm?release=2010-129&cid=release_2010-129 http://www.nasa.gov/cassini and http://saturn.jpl.nasa.gov .

ARECIBO RADAR CLICKS ASTEROID'S PICTURE

Near-Earth asteroid 2005 YU55 was "imaged" by the Arecibo Radar Telescope in Puerto Rico on April 19. Data collected during Arecibo's observation of 2005 YU55 allowed the Near-Earth Object Program Office at NASA to refine the space rock's orbit, allowing scientists to rule out any possibility of an Earth impact for the next 100 years. The space rock was about 2.3 million kilometers (1.5 million miles) from Earth at the time this image of the radar echo was generated.

The ghostly image has a resolution of 7.5 meters (25 feet) per pixel. It reveals 2005 YU55 as a spherical object about 400 meters (1,300 feet) in size. Not only can the radar provide data on an asteroid's

dimensions, but also on its exact location in space. Using Arecibo's high-precision radar astrometry capability, scientists were able to reduce orbit uncertainties for YU55 by 50 percent.



Radar image of asteroid 2005 YU55. Image credit: NASA/Cornell/Arecibo

"*At one time we had classified 2005 YU55 as a potential threat*," said Steve Chesley, a scientist at JPL's Near-Earth Object Program Office. "*Prior to the Arecibo radar passes on April 19 thru 21, we had eliminated almost all upcoming Earth flybys as possibilities of impact. But there were a few that had a low remaining probability of impact. After incorporating the data from Arecibo, we were able to rule impacts out entirely for the next 100 years*." With more observations in the coming years, scientists may be able to accurately plot 2005 YU55's orbit even further out.

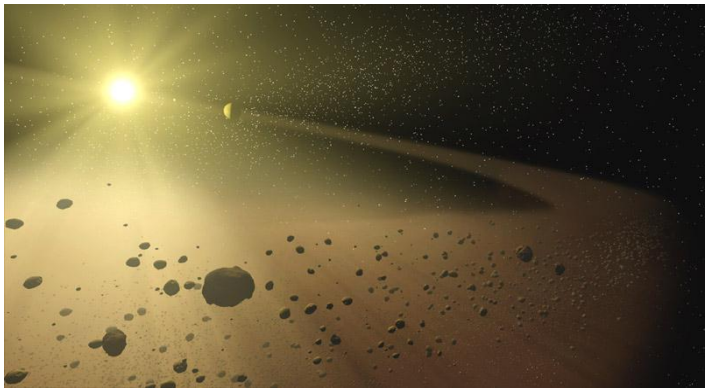
NASA detects, tracks and characterizes asteroids and comets passing close to Earth using both ground- and space-based telescopes. The Near-Earth Object Observations Program, commonly called "Spaceguard," discovers these objects, characterizes a subset of them, and plots their orbits to determine if any could be potentially hazardous to our planet. More information about asteroids and near-Earth objects is at: http://www.jpl.nasa.gov/asteroidwatch

SCIENTISTS SAY ICE LURKS IN ASTEROID'S COLD HEART

Scientists using a NASA funded telescope have detected water-ice and carbon-based organic compounds on the surface of an asteroid. The cold hard facts of the discovery of the frosty mixture on one of the asteroid belt's largest occupants, suggests that some asteroids, along with their celestial brethren, comets, were the water carriers for a primordial Earth. "*For a long time the thinking was that you couldn't find a cup's worth of water in the entire asteroid belt*," said Don Yeomans, manager of the Near-Earth Object Program Office. "*Today we know you not only could quench your thirst, but you just might be able to fill up every pool on Earth - and then some*."

The discovery is a result of six years of observing asteroid 24 Themis by astronomer Andrew, who along with Joshua Emery, employed the NASA Infrared Telescope Facility to take measurements of the asteroid on seven separate occasions beginning in 2002. Buried in their compiled data was the consistent infrared signature of water ice and carbon-based organic materials.

The study's findings are particularly surprising because it was believed that Themis, orbiting the sun at "only" 479 million kilometers (297 million miles), was too close to the solar system's fiery heat source to carry water ice left over from the solar system's origin 4.6 billion years ago. Now, the astronomical community knows better.



In this artist's concept, a narrow asteroid belt filled with rocks and dusty debris orbits a star similar to our own sun. Image credit: NASA/JPL-Caltech

The research could help re-write the book on the solar system's formation and the nature of asteroids. "*This is exciting because it provides us a better understanding about our past - and our possible future*," said Yeomans. "*This research indicates that not only could asteroids be possible sources of raw materials, but they could be the fueling stations and watering holes for future interplanetary exploration*."

Rivkin and Emory's findings were independently confirmed by a team led by Humberto Campins. NASA detects, tracks and characterizes asteroids and comets passing close to Earth using both ground- and space-based telescopes. The Near-Earth Object Observations Program, commonly called "Spaceguard," discovers these objects, characterizes a subset of them, and plots their orbits to determine if any could be potentially hazardous to our planet. More information about asteroids and near-Earth objects is at: http://www.jpl.nasa.gov/asteroidwatch .

HOW TO SEE THE BEST METEOR SHOWERS OF 2010: TOOLS, TIPS AND 'SAVE THE DATES'

A Perseid meteor. Image credit: Jimmy Westlake

There are seven major meteor showers remaining in 2010 (the Quadrantids occurred in early January 2010), with some more active than others. For example, April's Lyrids are expected to produce about 15 meteors an hour at their peak for observers viewing in good conditions. Now, if you put the same observer in the same good conditions during a higher-rate shower like August's Perseids or December's Geminids, that person could witness up to 100 meteors an hour during peak activity.

Whether you're watching from a downtown area or the dark countryside, here are some tips to help you enjoy the best meteor showers of 2010.

First a word about the moon -- it is not your (the expectant meteor watcher's) friend. Light reflecting off a bright moon can be just as detrimental to good meteor viewing as those bright lights of the big city. There is nothing you can do except howl at the moon, so you'll have to put up with it or wait until the next favorable shower. Even though the 2010 Perseids and Geminids will share the night sky with the moon, they are still expected to produce more visible meteor activity than other major showers that don't have an interfering moon.

The best thing you can do to maximize the number of meteors you'll see is to get as far away from urban light pollution as possible and find a location with a clear, unclouded view of the night sky. If you enjoy camping, try planning a trip that coincides with dates of one of the meteor showers listed below. Once you get to your viewing location, search for the darkest patch of sky you can find, as meteors can appear anywhere overhead. The meteors will always travel in a path away from the constellation for which the shower is named. This apparent point of origin is called the "radiant." For example, meteors during a Leonid meteor shower will appear to originate from the constellation Leo.

(Note: the constellation only serves as a helpful guide in the night's sky. The constellation is not the actual source of the meteors. For an overview of what causes meteor showers click on Meteor Showers: Shooting for Shooting Stars)

Whether viewing from your front porch or a mountaintop, be sure to dress for success. This means clothing appropriate for cold overnight temperatures, which might include mittens or gloves, and blankets. This will enable you to settle in without having to abandon the meteor-watching because your fingers are starting to turn colors.

Next, bring something comfortable sit on. While Mother Nature can put on a magnificent celestial display, meteor showers rarely approach anything on the scale of a July 4th fireworks show. Plan to be patient and watch for at least a half-hour. A reclining chair will make it far more comfortable to keep your gaze on the night sky.

Lastly, put away the telescope or binoculars. Using either reduces the amount of sky you can see at one time, lowering the odds that you'll see anything but dark sky. Instead, let your eyes hang loose and not look in any one specific spot. Relaxed eyes will quickly zone in on any movement up above, and you'll be able to spot more meteors.

The meteor showers listed below will provide casual meteor observers with the most bang for their buck. They are the easiest to observe and most active. All these showers are best enjoyed in the hours after midnight.

Major Meteor Showers of 2010

Eta Aquarids
Comet of origin: 1P Halley
Radiant: constellation Aquarius
Active: April 28-May 21
Peak Activity: Early morning May 6
Peak Activity Meteor Count: Up to approximately 60 meteors per hour (southern hemisphere), 15 meteors per hour (northern hemisphere). A less-than-half-full moon is expected to severely hamper viewing
Time of optimal viewing: Just before dawn
Meteor Velocity: 67 kilometers (42 miles) per second

Delta Aquarids
Comet of origin: unknown
Radiant: constellation Aquarius
Active: July 14-Aug. 18
Peak Activity: No definite peak, but nights surrounding July 30 may be best
Peak Activity Meteor Count: Approximately 15 meteors per hour (northern hemisphere). Unfortunately, an almost-full moon will obscure many a meteor during this year's peak.
Time of optimal viewing: An hour or two before dawn. Meteor watchers in the southern hemisphere and in the northern hemisphere's tropical latitudes will enjoy the best views.
Meteor Velocity: 42 kilometers (26 miles) per second

Perseids
Comet of origin: 109P/Swift-Tuttle
Radiant: constellation Perseus
Active: Perseids begin to rise early August.
Peak Activity: Night of Aug. 12-13
Peak Activity Meteor Count: Approximately 50 meteors per hour
Time of optimal viewing: Crescent moon will set early in the evening, allowing for dark skies all the way up until peak viewing just before dawn
Meteor Velocity: 61 kilometers (38 miles) per second
Note: The Perseid meteor shower is one of the most consistent performers and considered by many as this year's best shower. The meteors they produce are among the brightest of all meteor showers.

Orionids
Comet of origin: 1P/Halley
Radiant: just to the north of constellation Orion's bright star Betelgeuse.
Active: Oct. 4-Nov. 14
Peak Activity: Night of Oct. 22, but the light reflecting off an almost-full moon makes 2010 a less-than-spectacular year for one of Mother Nature's most spectacular showers.
Peak Activity Meteor Count: Approximately 15 meteors per hour, if the sky is dark
Time of optimal viewing: An hour or two before dawn
Meteor Velocity: 68 kilometers (42 miles) per second
Note: With the second-fastest entry velocity of the annual meteor showers, meteors from the Orionids produce yellow and green colors and have been known to produce an odd fireball from time to time.

Leonids
Comet of origin: 55P/Tempel-Tuttle
Radiant: constellation Leo
Active: Nov. 7-28
Peak Activity: Night of Nov. 17-18
Peak Activity Meteor Count: Approximately 15 per hour
Time of optimal viewing: A half-full moon sets after midnight, allowing for a dark sky. Best viewing time will be just before dawn.
Meteor Velocity: 71 kilometers (44 miles) per second
Note: The Leonids have not only produced some of the best meteor showers in history, but have sometimes achieved the status of meteor storm. During a Leonid meteor storm, many thousands of meteors per hour can shoot across the sky. Scientists believe these storms recur in cycles of about 33 years, though the reason is unknown. The last documented Leonid meteor storm occurred in 2002.

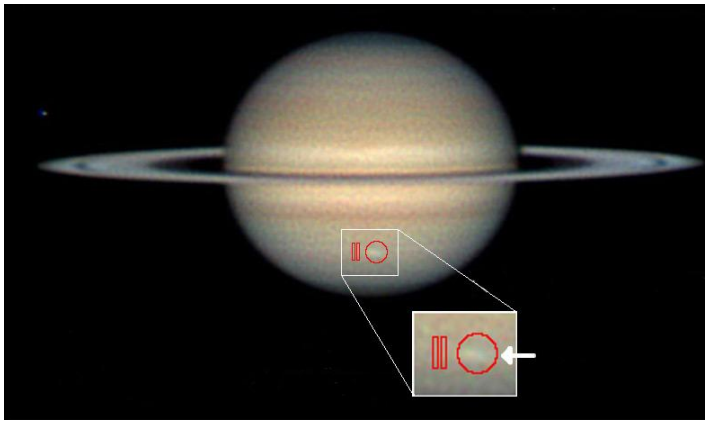
Geminids
Comet of origin: 3200 Phaethon
Radiant: constellation Gemini

Active: Dec. 4-16
Peak Activity: Night of Dec 13 -14
Peak Activity Meteor Count: Approximately 50 meteors per hour
Time of optimal viewing: 2 a.m.
Meteor Velocity: 35 kilometers (22 miles) per second
Note: Generally, the Geminids or August's Perseids provide the best meteor shower show of the year. Geminids are usually considered the best opportunity for younger viewers because the show gets going around 9 or 10 p.m. Unfortunately the moon does not set until after midnight this year, making for the possibility of drooping eyelids from the pre-teen set.

Cassini and Amateurs Chase Storm on Saturn

With the help of amateur astronomers, the composite infrared spectrometer instrument aboard Cassini spacecraft has taken its first look at a massive blizzard in Saturn's atmosphere. The instrument collected the most detailed data to date of temperatures and gas distribution in that planet's storms. The data showed a large, turbulent storm, dredging up loads of material from the deep atmosphere and covering an area at least five times larger than the biggest blizzard in this year's Washington, D.C.-area storm front nicknamed "Snowmageddon." "*We were so excited to get a heads-up from the amateurs*," said Gordon Bjoraker, a composite infrared spectrometer team member. Normally, he said, "*Data from the storm cell would have been averaged out*."

Cassini's radio and plasma wave instrument and imaging cameras have been tracking thunder and lightning storms on Saturn for years in a band around Saturn's mid-latitudes nicknamed "storm alley." But storms can come and go on a time scale of weeks, while Cassini's imaging and spectrometer observations have to be locked in place months in advance.



Amateur astronomer Christopher Go took this image of the storm on March 13, 2010. The arrow indicates the location of the storm and the red outlines show where Cassini's composite infrared spectrometer gathered data. C.Go and NASA/JPL-Caltech/GSFC

The radio and plasma wave instrument regularly picks up electrostatic discharges associated with the storms, so team members have been sending periodic tips to amateur astronomers, who can quickly go to their backyard telescopes and try to see the bright convective storm clouds. Amateur astronomers including Anthony Wesley, Trevor Barry and Christopher Go got one of those notices in February and were able to take dozens of pictures over the next several weeks.

In late March, Wesley, an amateur astronomer from Australia who was actually the first person to detect the new dark spot caused by an impact on Jupiter last summer, sent Cassini scientists an e-mail with a picture of the storm.

"*I wanted to be sure that images like these were being seen by the Cassini team just in case this was something of interest to be imaged directly by Cassini or the Hubble Space Telescope*," Wesley wrote.

Cassini scientists eagerly pored through the images, including a picture of the storm at its peak on March 13 by Go, who lives in the Philippines. By a stroke of luck, the composite infrared spectrometer happened to be targeting the latitude of the storms. The instrument's scientists knew there could be storms there, but didn't know when they might be active.

Data obtained by the spectrometer on March 25 and 26 showed larger than expected amounts of phosphine, a gas typically found in Saturn's deep atmosphere and an indicator that powerful currents were dredging material upward into the upper troposphere. The spectrometer data also showed another signature of the storm: the tropopause, the dividing line between the serene stratosphere and the lower, churning troposphere, was about 0.5 Kelvin (1 degree Fahrenheit) colder in the storm cell than in neighboring areas.

"*A balloonist floating about 100 kilometers down from the bottom of Saturn's calm stratosphere would experience an ammonia-ice blizzard with the intensity of Snowmageddon*," said Brigette Hesman, a composite infrared spectrometer team member who is an assistant research scientist. "*These blizzards appear to be powered by violent storms deeper down - perhaps another 100 to 200 kilometers down - where lightning has been observed and the clouds are made of water and ammonia*."

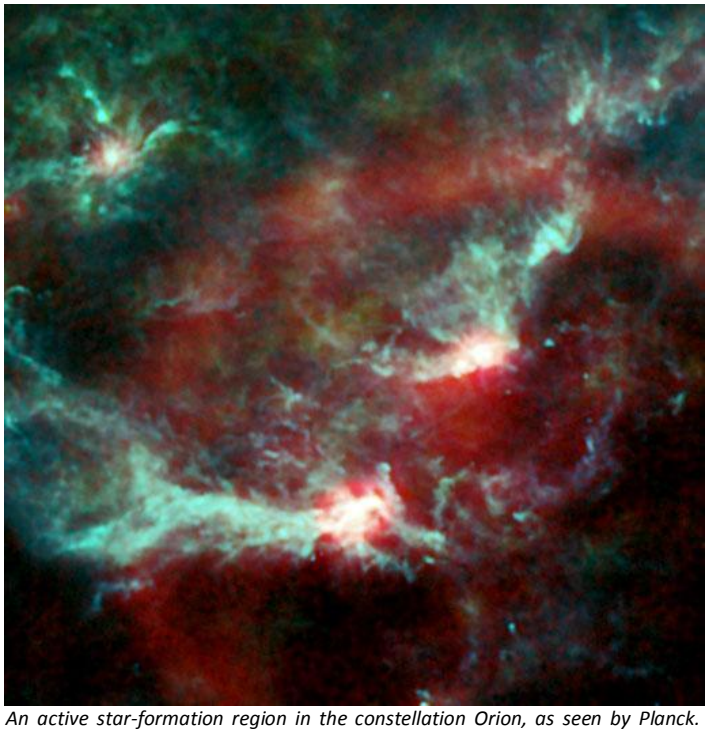
Planck Sees a Cold and Stormy Orion

The big hunter in the sky is seen in a new light by Planck. The long-wavelength image shows most of the constellation Orion, highlighting turbid clouds of cold material, where new stars are being stirred into existence. The Planck mission is busy surveying the whole sky at longer wavelengths of light than we can see with our eyes, ranging from infrared to even longer-wavelength microwaves. It is collecting ancient light from when the universe was very young, less than half a million years old, telling us about the birth and fate of our universe. In the process, the mission is gathering data on our Milky Way galaxy that astronomers are using to see through cold pools of gas and dust, which block visible-light views of star formation.

The new image shows one such region in our Milky Way, where stars are actively bursting to life. The much-photographed Orion nebula is the bright spot to the lower center. The bright spot to the right of center is around the Horsehead Nebula, so called because at high magnifications a pillar of dust resembles a horse's head. The whole view covers a square patch of sky equivalent to 26 by 26 moons.

"*Because Planck is mapping the whole sky, we can capture mosaics of huge regions of the Milky Way*," said Charles Lawrence, the NASA project scientist for Planck. "*We are seeing the coldest material in star-forming regions, where stars are at the very earliest stages of formation*."

The giant red arc of Barnard's Loop is thought to be the blast wave from a star that blew up inside the region about two million years ago. The bubble it created is now about 300 light-years across. The picture shows light resulting from two different types of sources.



An active star-formation region in the constellation Orion, as seen by Planck. This long-wavelength image covers a square region of 13 by 13 degrees (which is equivalent to 26 by 26 full moons). It is a three-color combination constructed from three of Planck's nine frequency channels: 30, 353 and 857 gigahertz. The giant red arc of Barnard's Loop is thought to be the blast wave from a star that blew up inside the region about two million years ago. The bubble it created is now about 300 light-years across. Image credit: ESA/LFI & HFI Consortia

At the lowest frequencies, Planck primarily maps emission from ionized gas heated by newly formed hot stars. At higher frequencies, Planck maps the meager heat emitted by extremely cold dust. This can reveal the coldest cores in the clouds, which are approaching the final stages of collapse, before they are reborn as full-fledged stars. Another new image from Planck shows a similar, yet less vigorous star-forming area called Perseus. It is online at: http://www.nasa.gov/planck http://www.nasa.gov/mission_pages/planck/planckperseus20100426.html and http://www.esa.int/planck .

'This Planet Tastes Funny,' According to Spitzer

Spitzer Space Telescope has discovered something odd about a distant planet -- it lacks methane, an ingredient common to many of the planets in our solar system. "*It's a big puzzle*," said Kevin Stevenson, a planetary sciences graduate student, lead author of the study. "*Models tell us that the carbon in this planet should be in the form of methane. Theorists are going to be quite busy trying to figure this one out*."

The discovery brings astronomers one step closer to probing the atmospheres of distant planets the size of Earth. The methane-free planet, called GJ 436b, is about the size of Neptune, making it the smallest distant planet that any telescope has successfully "tasted," or analyzed. Eventually, a larger space telescope could use the same kind of technique to search smaller, Earth-like worlds for methane and other chemical signs of life, such as water, oxygen and carbon dioxide. "*Ultimately, we want to find bio-signatures on a small, rocky world. Oxygen, especially with even a little methane, would tell us that we humans might not be alone*," said Stevenson. "*In this case, we expected to find methane not because of the presence of life, but because of the planet's chemistry. This type of planet should have cooked up methane. It's like dipping bread into beaten eggs, frying it, and getting oatmeal in the end*," said Joseph Harrington, the principal investigator of the research.

Methane is present on our life-bearing planet, manufactured primarily by microbes living in cows and soaking in waterlogged rice fields. All of the giant planets in our solar system have methane too, despite their lack of cows. Neptune is blue because of this chemical, which absorbs red light. Methane is a common ingredient of relatively cool bodies, including "failed" stars, which are called brown dwarfs. In fact, any world with the common atmospheric mix of hydrogen, carbon and oxygen, and a temperature up to 1,000 Kelvin (1,340 degrees Fahrenheit) is expected to have a large amount of methane and a small amount of carbon monoxide. The carbon should "prefer" to be in the form of methane at these temperatures. At 800 Kelvin (or 980 degrees Fahrenheit), GJ 436b is supposed to have abundant methane and little carbon monoxide. Spitzer observations have shown the opposite. The space telescope has captured the planet's light in six infrared wavelengths, showing evidence for carbon monoxide but not methane. "*We're scratching our heads*," said Harrington. "*But what this does tell us is that there is room for improvement in our models. Now we have actual data on faraway planets that will teach us what's really going on in their atmospheres*."

GJ 436b is located 33 light-years away in the constellation Leo, the Lion. It rides in a tight, 2.64-day orbit around its small star, an "M-dwarf" much cooler than our sun. The planet transits, or crosses in front of, its star as viewed from Earth. Spitzer was able to detect the faint glow of GJ 436b by watching it slip behind its star, an event called a secondary eclipse. As the planet disappears, the total light observed from the star system drops -- this drop is then measured to find the brightness of the planet at various wavelengths. The technique, first pioneered by Spitzer in 2005, has since been used to measure atmospheric components of several Jupiter-sized exoplanets, the so-called "hot Jupiters," and now the Neptune-sized GJ 436b. "*The Spitzer technique is being pushed to smaller, cooler planets more like our Earth than the previously studied hot Jupiters*," said Charles Beichman, director of NASA's Exoplanet Science Institute. "*In coming years, we can expect that a space telescope could characterize the atmosphere of a rocky planet a few times the size of the Earth. Such a planet might show signposts of life*." This research was performed before Spitzer ran out of its liquid coolant in May 2009, officially beginning its "warm" mission. http://www.spitzer.caltech.edu/spitzer http://www.nasa.gov/spitzer .

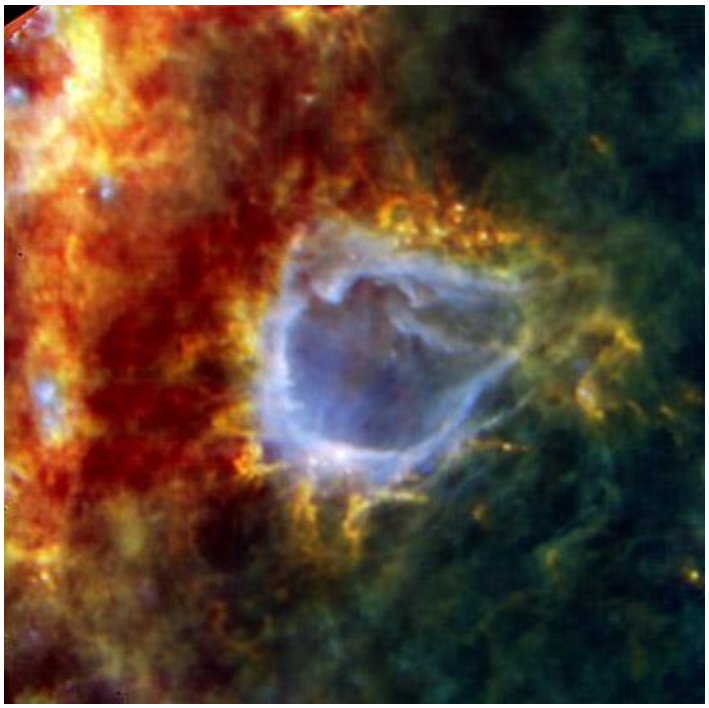
Herschel Reveals the Hidden Side of Star Birth

The first scientific results from Herschel infrared space observatory are revealing previously hidden details of star formation. New images show thousands of distant galaxies furiously building stars and beautiful star-forming clouds draped across the Milky Way. One picture even catches an 'impossible' star in the act of formation. The results challenge old ideas of star birth, and open new roads for future research.

Herschel's observation of the star-forming cloud RCW 120 has revealed an embryonic star which looks set to turn into one of the biggest and brightest stars in our Galaxy within the next few hundred thousand years. It already contains eight to ten times the mass of the Sun and is still surrounded by an additional 2000 solar masses of gas and dust from which it can feed further. "*This star can only grow bigger*," says Annie Zavagno, Laboratoire d'Astrophysique de Marseille.

Massive stars are rare and short-lived. To catch one during formation presents a golden opportunity to solve a long-standing paradox in astronomy. "*According to our current understanding, you should not be able to form stars larger than eight solar masses*," says Dr Zavagno.

This is because the fierce light emitted by such large stars should blast away their birth clouds before any more mass can accumulate. But somehow they do form. Many of these 'impossible' stars are already known, some containing up to 150 solar masses, but now that Herschel has seen one near the beginning of its life, astronomers can use the data to investigate how it is defying their theories.



The Galactic bubble RCW 120

Stellar pregnancy and birth in the Milky Way - Herschel is the largest astronomical telescope ever to be placed into space. The diameter of its main mirror is four times larger than any previous infrared space telescope and one and a half times larger than Hubble. As stars begin to form, the surrounding dust and gas is warmed up to a few tens of degrees above absolute zero and starts to emit at far-infrared wavelengths. The Earth's atmosphere completely blocks the majority of these wavelengths and thus observations from space are necessary.

Stellar 'assembly line' in Vulpecula - Using its unprecedented resolution and sensitivity, Herschel is conducting a census of star-forming regions in our Galaxy. "*Before Herschel, it was not clear how the material in the Milky Way came together in high enough densities and at sufficiently low temperatures to form stars*," says Sergio Molinari, Istituto di Fisica dello Spazio Interplanetario, Roma. A new Herschel image covering a number of stellar nurseries in the Milky Way shows how it happens. Stellar embryos first appear inside filaments of glowing dust and gas draped across the Galaxy. These form chains of stellar nurseries, tens of light-years long, wrapping the Galaxy in a web of star birth.

Herschel has also been surveying deep space beyond our Galaxy, and has measured the infrared light from thousands of other galaxies, spread across billions of light-years of the Universe. Each galaxy appears as just a pinprick but its brightness allows astronomers to determine the rate of star birth within it. Roughly speaking, the brighter the galaxy the more stars it is forming.

Distant galaxies and nearby gas from Herschel - Here, too, Herschel has challenged our previous understanding by showing that galaxies have been evolving over cosmic time much faster than previously thought. Astronomers believed that galaxies have been forming stars at about the same rate for the last three billion years. Herschel shows this is not true. In the past, there were many more so-called 'starburst' galaxies forming stars at 10–15 times the rate we see in the Milky Way today. But what triggered this frantic activity is not completely understood. "*Herschel will now let us investigate the reasons for this behavior*," says Steve Eales.

Herschel is also a prime instrument for detecting the smallest forms of matter: molecules. It has made the first discovery in space of a new 'phase' of water. It is electrically charged and unlike the more familiar phases, namely solid ice, liquid water and gaseous steam, it does not occur naturally on Earth. In the birth clouds surrounding young stars, however, where ultraviolet light is pumping through the gas, this irradiation can knock an electron out of the water molecule, leaving it with an electrical change. "*This detection of ionized water vapor came as a surprise*," says Arnold Benz, ETH Zurich, Switzerland. "*It tells us that there are violent processes taking place during the early birth stages which lead to widespread energetic radiation throughout the cloud*." From the biggest galaxies to the smallest molecules, these and many other Herschel results are being presented to the scientific community at the Herschel First Results Symposium, ESLAB 2010. "*These are still early days for Herschel and this is just the beginning of all the science that we will get from this mission in the years to come*," says Göran Pilbratt, ESA Herschel Project Scientist.

M82: "Survivor" Black Holes May Be Mid-Sized

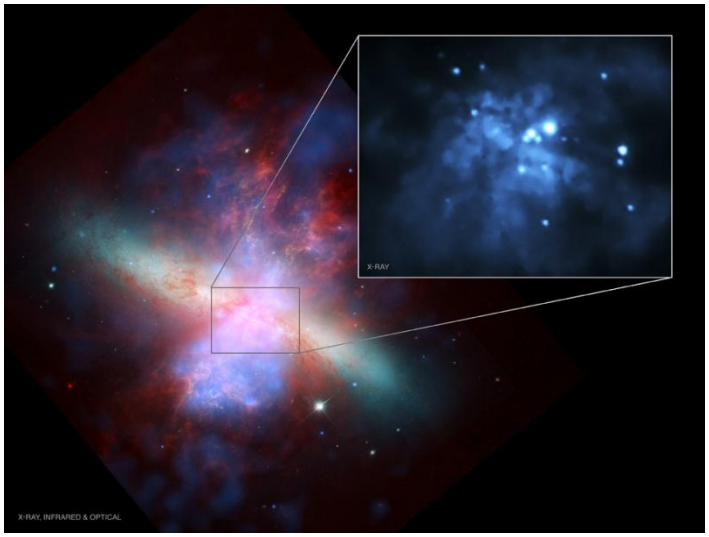
Astronomers have found evidence for two intermediate-mass black holes in the M82 galaxy. It has been a mystery of whether black holes exist with masses in between the stellar mass and supermassive categories. Evidence suggests that these two objects avoided falling into the giant black hole at the center of M82. It is possible these intermediate-mass black holes are examples of seeds required for the growth of supermassive black holes.

This is the first case where good evidence for more than one mid-sized black hole exists in a single galaxy. The evidence comes from how their X-ray emission varies over time and analysis of their X-ray brightness and spectra, i.e., the distribution of X-rays with energy.

One of the black holes (called "X42.3+59") is located at a projected distance of 290 light years from the center of M82 (labeled with an "x") and its mass is estimated to be between 12,000 and 43,000 times the mass of the Sun. At this close distance, if the black hole was born at the same time as the galaxy and its mass was more than about 30,000 solar masses, it likely would have been pulled into the center of the galaxy. That is, it may have just escaped falling into the supermassive black hole that is presumably located in the center of M82.

The second black hole (called "X41.4+60") is located 600 light years in projection away from the center of M82. The best model for this M82 black hole has a mass between 200 and 800 times that of the Sun, and tilted at an angle between 60 and 80 degrees, meaning that the disk is viewed almost side-on. However, because of relativistic effects for a rapidly spinning black hole with this mass, a disk viewed at a high inclination is almost as bright as one viewed at a low inclination (i.e., face-on).

New studies with Chandra and XMM-Newton show that these two sources may be intermediate-mass black holes, with masses in between those of the stellar-mass and supermassive variety. These "survivor" black holes avoided falling into the center of the galaxy and could be examples of the seeds required for the growth of supermassive black holes in galaxies, including the one in the Milky Way.



This composite image of the nearby starburst galaxy M82 shows Chandra X-ray Observatory data in blue, optical data from the Hubble Space Telescope in green and orange, and infrared data from the Spitzer Space Telescope in red. The pullout is a Chandra image that shows the central region of the galaxy and contains two bright X-ray sources.

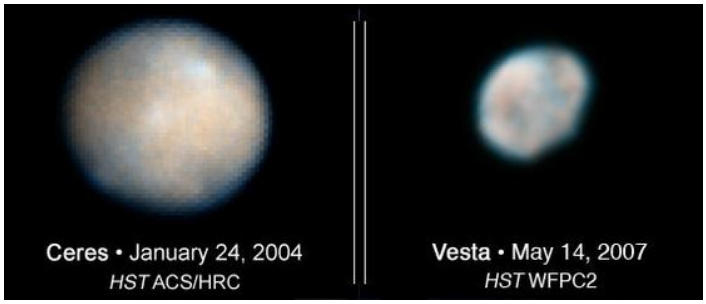
These results are interesting because they may help address the mystery of how supermassive black holes in the centers of galaxies form. M82 is located about 12 million light years from Earth and is the nearest place to us where the conditions are similar to those in the early Universe, with lots of stars forming. Multiple observations of M82 have been made with Chandra beginning soon after launch. The Chandra data shown here were not used in the new research because the X-ray sources are so bright that some distortion is introduced into the X-ray spectra. To combat this, the pointing of Chandra is changed so that images of the sources are deliberately blurred, producing fewer counts in each pixel.

DAWN'S NEW TECH FLIGHT TO ORBIT TWO ASTEROIDS

Powered with a futuristic sounding new technology called "ion propulsion," Dawn is slowly climbing away from the sun, beyond Mars, on its way to its first destination, asteroid Vesta. Dawn will enter orbit around this rocky world for a year, exploring its mysteries. Then Dawn will do something unprecedented in real-world spaceflight: exit the orbit of one distant body, and fly to and orbit another. The second destination is asteroid Ceres. "*Dawn will be the first spacecraft ever built to orbit two target bodies after leaving Earth*," says Marc Rayman, Dawn chief engineer. "*There's not even a concept for doing such a mission with conventional propulsion systems. The spacecraft would have to carry so much fuel, it would be too heavy to launch*."

Instead, Dawn relies on ion propulsion, which doesn't require a huge spacecraft. Using solar arrays spanning 65 feet, Dawn collects power from the sun to ionize atoms of xenon. These ions are expelled by a strong electric field out the back of the spacecraft, producing a gentle thrust. The weightless and frictionless conditions of space flight allow this gossamer force effect to build up, so the spacecraft gains speed slowly and continuously. "*Dawn isn't exactly a hot rod,"* says Rayman. "*It would take 4 days to go from 0 to 60. But it ultimately achieves fantastically high velocity while consuming very little propellant. It uses only a kilogram of xenon every 4 days*." Typically, conventional rockets thrust for a few minutes at most before they run out of fuel, then they coast to their destination. Dawn's engines, on the other hand, are almost constantly active. Dawn's Chief Engineer Marc Rayman says "*Dawn will thrust for 5 ½ years!. It's already been thrusting for 591 days. That's 62% of the time it's been in space*." This means Dawn must be very fuel efficient. "*A typical Mars orbiter could consume more than 600 pounds of propellants to enter orbit around the red planet*," says Rayman. "*With its ion propulsion system, Dawn could do it with less than 60 pounds of xenon*." Add all of these advantages together and you get a spacecraft that can accomplish – well – the impossible. "*Dawn is taking us, in the truest sense, up close to two distant, alien, unexplored worlds*."

Its destinations -- Ceres and Vesta – are two of the biggest asteroids in the solar system. Indeed, Ceres is so big, it is actually classified as a dwarf planet, and Vesta is not far behind. Yet to date they've been studied only from a great distance, so they're virtually unknown. What is known is that they're not alike. "*Vesta is more like the rocky bodies of the inner solar system, one of which is right under our feet*," explains Rayman. "*And Ceres is more like the icy moons of the outer solar system. Scientists think it may even have a subsurface ocean of liquid water!"*



Hubble Space Telescope photos of Dawn's targets, giant asteroids Ceres and Vesta. [more] Credit: NASA/HST

Dawn's instruments will collect data and images to uncover the secrets these two bodies conceal and perhaps reveal why they're so different from one another even though they inhabit such similar regions of the solar system. "*This mission will help us understand what the conditions were when Vesta and Ceres formed at the dawn of the solar system. It will fit more pieces in the grand puzzle of how our solar system formed and evolved – and perhaps how others do as well*."

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.

The Star Gazer
P.O. Box 12746
Everett, WA 98206

In May's StarGazer:

The next EAS Meeting is 3:00 pm, Saturday May 8th at the Evergreen Branch Library.