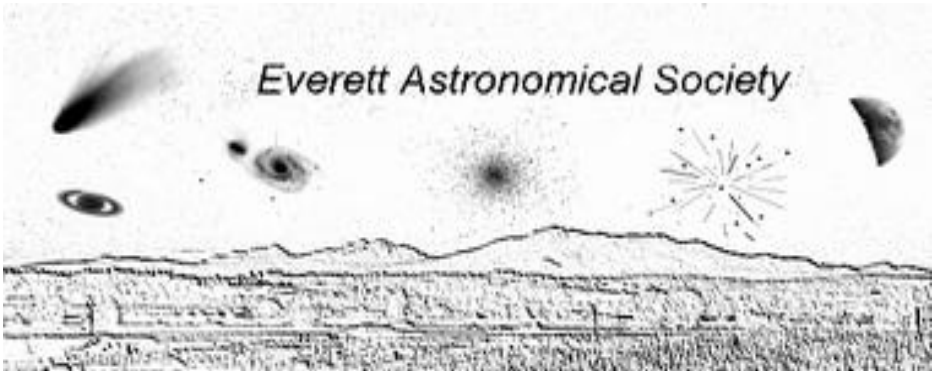
Volume MMX No. 6



The Stargazer

June 2010

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Librarian:	Chris Dennis		--	**Everett, WA 98206**
Treasurer:	Jerry Galt		jerryg at genwest dot com	
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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…

JUNE EAS MEETING - - SATURDAY JUNE 12TH - 3:00 PM

June's meeting was held June 12; the presentation was "The Outer Planets" focusing on Uranus, Neptune, Pluto and other trans-Neptunian objects . Mark also demo'd Clear Dark Sky Clock site.

JULY EAS MEETING - - SATURDAY JULY 17TH - 3:00 PM

July's meeting is set for July 17th, at the ***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 / BEGINNERS CLASS WITH JACK BARNES

The next class is the 22nd of June. 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.)*

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

JUNE -

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, Frontier Point Lodge, Bogus Basin Mountain Recreation Area, Bogus Basin ID

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 at Sunriver (MBSP), Sunriver Nature Center & Observatory resort (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

Sep 07-09 - CalStar, Lake San Antonio Park CA http://www.sjaa.net/calstar/ - http://www.sjaa.net/

Sep 10-12 - 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

June 2010

Jun 11 - Asteroid 1 Ceres Occults TYC 6845-00708-1 (11.6 Mag Star)
Jun 11 - EAS star party at Ron Tam's place
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 09 – EAS star party at Ron Tam's place
Jul 11 - Total Solar Eclipse, Visible in South Pacific, Chile
Jul 17 - Meeting – Saturday 3:00 pm Evergreen Branch Library
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 - EAS star party at Ron Tam's place
Aug 06 - Southern Iota Aquarids Meteor Shower Peak
Aug 07 - Mercury At Its Greatest Eastern (evening) Elongation (27 Deg)
Aug 09 - New Moon
Aug 12-15 Table Mt. Star Party, NW of Ellensburg, WA
Aug 11-15 Oregon Star Party, Ochocco Natl. Forest, Prineville OR
Aug 21 - Meeting – Saturday 3:00 pm Evergreen Branch Library
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

(Labor Day) - SAS Brooks Memorial Park Star Party
Sep 10 - EAS star party at Ron Tam's place
Sep 9-11 - Orion Nebula 2010 Star Party
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 08 - EAS star party at Ron Tam's place
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 - EAS star party at Ron Tam's place
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 03 - EAS star party at Ron Tam's place
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

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
Aug 03	Last Quarter Moon
Aug 10	New Moon
Aug 16	First Quarter Moon
Aug 24	Full Moon
Sep 01	Last Quarter Moon
Sep 08	New Moon

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

Object	*Rises*	*Sets*	*Con*	*Diam.*	*Mag*
Sun	***05:11 am***	***21:11***	***Tau***	***30'***	***-27.5***
Mercury	**04:34 am**	**20:08**	**Ari**	**11"**	**-1.4**
Venus	**08:16 am**	**23:35**	**Can**	**14"**	**-4.0**
Mars	**11:04 am**	**00:40 am**	**Leo**	**5"**	**+1.3**
Jupiter	**01:22 am**	**13:23**	**Psc**	**40"**	**-2.4**
Saturn	**12:55**	**01:29 am**	**Vir**	**17"**	**+1.1**
Uranus	**01:07 am**	**13:18**	**Psc**	**03"**	**+5.8**
Neptune	**00:12 am**	**10:26 am**	**Aqr**	**02"**	**+7.9**
Pluto	**20:51**	**06:12 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

Some EAS volunteers are needed to conduct a star party for a nonprofit group at a camp Monday, July 19th at Camp Huston, just off of Hwy 2 next to Wallace Falls state park. Please contact Mark to confirm that we can commit to support this group so they can finalize their plans.

$$ - FINANCIAL HEALTH - $$

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

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 Ron Tam, or Jim Bielaga (425) 337-4384 to borrow a telescope.

SCOPE	LOAN STATUS
13-INCH THIN-MIRROR DOB	FINISHING REHAB
10-INCH WARD DOBSONIAN	**CURRENTLY ON LOAN**
10-INCH SONOTUBE DOBSONIAN	AVAILABLE
8-INCH DOBSONIAN	**CURRENTLY ON LOAN**
25-INCH MIRROR	CHARACTERIZATION

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.

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.* 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 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,\. 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.

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

Offices Still Vacant for 2010 -

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.

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 Mid June to Early July 2010**)**

- By John W Goerger - pos1@earthlink.net

A few days before, the first day of Summer had arrived but, within12-16 hours two groups of individuals would meet, and their meeting would change their destiny, and that of the United States of America.

There was a breeze coming from the south, but it wasn't strong, nor the temperature so cold, that a person didn't mind being outside and enjoying the company of one's compatriots. The sun had set around 7:30 PM, local; and if anyone had noticed, about an hour after sunset was the brightest star-like-object in the summer night sky; the planet ***Venus,*** *shinning over in the NW, with* ***Mars*** *close to setting at around 9:00 PM. Almost due West, a thin crescent Moon, just in front of the neck and below the head of the constellation* ***LEO****, would be setting within a hour or so, and one wonders if anyone might have paid any attention, or perhaps looked at it with a pair of field glasses? The field glasses they had with them, however, would only magnify 2.5X to no more than 4X, but still, they would allow a person to see craters, rays and perhaps, maybe a bit of earthshine. Looking due South, and a bit East, in the constellation known as* ***LIBRA****, was the second brightest star-like-object; Jupiter. Did any of the peoples who were outside notice it? It commanded notice, due to it being the brightest "star" after Venus had set. Several miles from where they were, was another group of individuals, but many times more numerous than the previous group of people, and also one wonders if any of them paid any attention to the glittering celestial lights above them? The two very bright star-like-objects did not glitter, but shined brighter than the other multi-colored twinkling lights, and did they notice the moon? If they had, what were their thoughts? What impressions, if any, did it have on them, or the party of the other human beings, a few miles from their location?*

*By the time the moon had set, it was DARK! For many of the **FIRST GROUP** of people, thoughts of "turning in", getting a "good night's sleep" was no doubt on quite a few of their minds. The only "light" was from the stars and the Milky Way going from the NNE toward the SSW, around **MIDNIGHT**. Jupiter, and the constellation it was in, was already over in the SSW part of the sky, and if anyone noticed, over in the ESE was another non-twinkling, but steady-glowing, butterscotch-colored star known as **Saturn**. However, the leader of this group had a surprise for them---they were not going to sleep, and as a matter-of-fact he told them to start heading East; in the direction of that other much larger group, which at the time he didn't think it was; but it WAS!*

*By 2:00 AM, Jupiter was setting, and Saturn, in the constellation of AQUARIUS, was in a good position for anyone who knew "naked-eye" astronomy would have seen it clearly, over in the SE. By 3:00 AM, some of the elements of the FIRST GROUP were allowed to take a rest, while the remaining elements did what was required of them. Close to the ZENITH were the constellations; **CYGNUS**, **LYRA**, **CEPHEUS** and the star Vega, one of the brighter, more noticeable stars, just a bit to the right. During their night trip, the star Arcturus, a reddish colored object in the Northern part of the sky, could have been seen by them as well. For the larger **SECOND GROUP**, who knows? Who knows whether there were individuals from either group who might have paid attention to the celestial display above them? For what both groups knew, was that there was to be a meeting between both of them. Initially, the FIRST GROUP had thought about waiting one more day, and then during the following night, make contact with the SECOND GROUP, but given unforeseen circumstances, that arose, both groups would meet each other later, that day, and become history.*

*The day came and went and once again it was nightfall; the time was around 9:00 PM. Venus was low in the NW, with Mars setting at almost the same time. Jupiter, in the constellation of LIBRA, was now almost on the Median line that dissects the night sky into two half's, East and West, was almost due South. The Moon was First Quarter and was near the back leg of the constellation **LEO**. Now, only the larger SECOND GROUP were getting ready for sleep under the blanket of infinity above them, the FIRST GROUP was not; for the location was called The **LITTLE BIGHORN,** in a region that would later be known as the Southeastern sector of the state of MONTANA---the date was JUNE 25, 1876. By the first of July, 1876 the Moon was **FULL,** and was just below Jupiter, over in the Southwestern part of the night sky around 10:00 PM; there overlooking the hills of the Little Bighorn.*

★★★

For many years there have been huge quantities written about THE BATTLE OF THE LITTLE BIGHORN; newspaper articles, magazines and books, as well as movies. What most folks many not realize or understand, the 7th Calvary was the **CRACK CAVALRY UNIT** of the United States Army at that time! The plains Indians that won that battle were the **FINEST LIGHT HORSE CAVALRY** on the PLANET! People have to get an understanding that it wasn't a LAST STAND for the 7th , but a **LAST STAND** for what even Custer had considered (believe it or not) to be the only, true **ACTUAL AMERICANS; the American Indian Nations**. Whether you disagree or not with Custer, you have to understand that he was following orders from Washington, and Grant, the President of the United States, ***could not stand*** Custer. Grant's Administration was a disaster when it came to working with the American Indian Nations. In 1873, the national debt (wow they were overspending as well?) was a staggering TWO BILLION dollars in the "hole". Custer was ordered to take an expedition in 1874, into the area known as the BLACK HILLS, which had been given to the **Lakota Indian Nation**. Gold, and other precious metals were discovered, and eventually those within the Grant's Administration decided to get the land back from the Lakota's, by offering to purchase it. IT WAS THIER HOME, and important in many ways to them. It was at that point that Grant's people decided to treat them as "HOSTILES", which of course they were not! I graduated from High School in Tustin CA in 1970, and two years before, my parents and I had left Montana for California. When I graduated, it was only 94 years since the BATTLE OF THE LITTLE BIGHORN. There were people still living in the U.S, when I graduated, who had been born before the Battle of the Little Bighorn. It would be six years later that we would deal with One-Hundredth "Anniversary" of that battle, and this year, 2010, marks the 134TH 'Anniversary'.

★★★

The Universe does not give a damn about us! The only "beings" that should give "a damn" about us, is "US"! We love looking at the beauty, wonder, and mystery of infinity, but for the "UNIVERSE"---nope---no intelligence, just EXISTENCE---our planet just orbits about our star, our moon orbiting about the Earth, and the rest of the planets just orbiting about our sun, with the whole mess just orbiting about the galaxy without a care. WE HUMANS give "MEANING" to the COSMOS----a dog cannot understand the Sun; sure, a bird might navigate by the "stars", but it has no clue as to what the stars are, nor does it care. We humans are the only creature on this "island in space" that UNDERSTANDS and CARES---about our relationship we have with the cosmos, and us. In fact, Ray Bradbury has stated "WE ARE THE UNIVERSE, LOOKING BACK AT ITSELF AND YELLING; WE EXIST! WE MATTER!" Given that, without "US" the Universe has no meaning! It really saddens me when, at times, I will be watching some science program, religious program, or even a news program, where some clown is stating; "We humans are not that important. Look at what we do to 'God's Creation', or what we are doing to the 'ENVIRONMENT'. Mankind is bad, we are unworthy,…, oh poor me, etc., etc." Always criticizing, but never suggesting how wonderful and intelligent we are, as a species! Do you realize that over 90-99% of all species that have ever existed on Earth are gone? Then there are those in many fields who like to tell us what they think our role, or our "OUR PLACE" is in the Cosmos! Who are they to decide what they think is our "place" in this vast cosmos? We are individuals, and as such, can move from one "place" or to another "group"; it is your choice, your decision.

Sure, it is easy to blame "US" for all of Earth's problems, and there are those of us who do cause terrible problems for us and planet Earth; (see: Hitler, Osama bin Laden, Tojo, Stalin, Mao Zedong - he killed even more people than Hitler & Stalin combined). These guys were horrible, but stop putting the rest of HUMANITY into the same "league" as these clowns. Maybe someday in the far distant distant future we humans may find a way to "treat" these homicidal maniacs, but for now we have no choice but to "take them out" and to prevent their followers from "following in their footsteps". Our Solar System has plenty of unlimited resources for everyone! The sun is an unlimited energy supply! Just think what kind of electrical energy we could supply to the rest of the human population of Earth, if we were to build SOLAR SATELLTIE POWER STATIONS, located at Geosynchronous Orbit. Just one of them would produce over 1100 MEGAWATTS of electrical energy. ONE HUNDRED of them would give, just the United States of America all the electrical energy it uses in one year. 500 SSPS would give the entire planet's human population all the electrical energy the U.S. uses in a single year (SEE BEN BOVA).

To shutting down the Space Transportation System (the U.S. Space Shuttle Fleet), cancelling the manned missions to the moon, scrapping our latest generation of human-rated rockets and then loosing of upwards of thousands of skilled employees of NASA, the United States Government is going to create for its citizens and their offspring a very

dangerous future, and a future of no dreams, no hope, and no adventure. This will also affect the world at large as well. For many nations look to the United States for Leadership and Vision! Without the ability to continue to launch and retrieve astronaut crews, NASA and the US will become a society mired in regret, and doomed to live in the past. The PAST is where the dead are! One cannot relive the "past", as it is no more, it is gone. Without the knowledge, dedication, and commitment from those who are having to leave NASA because of the mentioned cancelled programs, those abilities cannot be replaced. There goes the "learning curve", back to "SQUARE ONE".

As mentioned in a previous column, when Juan Tripp, than the president of Pan Am wanted a commercial jet airliner, **BOEING** was ready to take up the challenge because it had done the "leg work"---they had a jet, the **DASH-80** and from there, they started producing the 707 and its military version. In the meantime Douglas had no "Physical Aircraft", just a "paper jetliner"; drawings, but no aircraft, no knowledge, expertise or understanding what it takes to test and build a commercial jetliner! Boeing took the lead, and never looked back. Douglas had to merge with other aircraft companies to "stay alive", and eventually was absorbed by Boeing. Even **AIRBUS**, which only survived only because of huge subsidies from various European Governments for aircraft that no one was buying, is trying to contend with Boeing. Over the last 4-5 years it was "discovered" that AIRBUS was trying to get U.S. Government contracts by not even going with what the contract spelled out, but something that wasn't even in the contracts. The question which I raised in my previous column is; if NASA has to go back to "SQUARE ONE" and give up going to the moon, and remember the **moon's area is equal to Africa and Australia** and this does not even take into account the amount of material wealth contained within the moon and its interior, are we just going to create lots of 'paper spaceships', studies and spends lots of money which go to engineers, corporate executives and in turn generate more 'paper spaceships and studies'? In other words---going nowhere only where companies like Douglas and other failed companies and countries went---nowhere!

There are no plans from the White House or NASA to actually have human mission(s) to an asteroid(s), just the word "maybe". Robotic missions do not make for "exciting expeditions". We send machines to "TEST THE WATERS", to find out what areas are within the parameters for safe human operations, and which are not. (EXAMPLE: No one in their 'right mind' would send humans to land on the planet Venus---they would all DIE!). If NASA (America) is to follow what President Obama is ordering NASA to take, then NASA, (think America) will become what the Aircraft Company DOUGLAS became; a non-entity---absorbed into another company or country. DO YOU WANT THAT TO HAPPEN? IF NOT, THAN CHANGE IT!

Working with Private Industry(s) to develop newer means of creating launch vehicles have always been on the plate for those of us stargazers who want humanity to expand into the infinite vista, which we consider humanity's new homes! The idea of investing taxpayers' money into private industry is not a new idea, nor is it one that many times, in our nation's past, has worked; the creation of the Telegraph, the Transcontinental Railroad, the Panama Canal, among other technological innovations. The key is, knowing what to invest the taxpayers' hard-earned money. When to withdraw those funds; when the project(s) becomes self-sufficient; or those that are clearly a waste; or in some cases may take too long to bare "fruit".

★★★

Gazing into the late Spring/Summer evening sky is such a joy (given all those stupid rain clouds we had to put up with, here in the Pacific Northwest. I remember Southern California, and all the stargazers would get happy knowing the good stuff that was lurking in the springtime sky, than would come the dreaded, MARINE LAYER---No not US MARINES from the Marine base, the crappy low level clouds that came off the ocean, or when the cool air of the Pacific mixed with the warm air from the desert) to finally aim our 'light buckets' into the infinite! **VENUS** on the 15th of June is just glowing its 'little heart out' for us, at a -4.0! Its angular diameter is coming close to 15" (arc seconds). Make sure you train your 'scope on it over in the western sky when the sunsets. Depending on where you are, you might even see it when the sun is still "up" or just after the sun does set. **MARS** is a bit higher than Venus, but shinning poorly at a 1.2 visual, also by the 15th. It is puny in angular size, around 6" (arc seconds) so only the largest of the stargazer's telescopes could have any ability to discern any features on its surface. **SATURN** is there in western evening sky, around the same apparent brightness as Mars, a 1.1. Saturn, along with its' rings, measure about 40' (arc seconds), and sets, toward the end of June, a bit after midnight; make sure you swing your stargazing instrument on this lovely 3-D like planet, before it gets too low to the horizon for observation.

JUPITER and **URANUS** are a lovely pair to locate and observe though your 'scope'. According to my sources, they will be within two degrees of each other for the remainder of June. By the 15th of June, Jupiter is a visual -2.5, while Uranus is at a 5.9. Jupiter has a diameter of close to 39.5", with Uranus at a very small 3.5. The First Day of Summer (Summer Solstice) happens on the 21st of June----and for the Southern Hemisphere, it is their "Winter Solstice". A partial lunar eclipse will occur on the 26th, a Saturday in the early predawn hours; anyone up to watching it? Didn't think so.

For July 1, **Venus and Saturn** are about 40 degrees in separation with Venus, now shinning at a -4.1, with Mars appearing, according to my sources, about 1% as bright as Venus. Yet, it shines at a respectable 1.4, with Saturn at a 1.1. All of these planet buddies are near the western part of the sky, so just give yourself some time; the sun will set and you can enjoy staring like some strange person through your telescope, making all sorts of odd, happy, sounds only another stargazer would understand. MERCURY actually 'pops up' in the western evening sky around the 15th of July, about 6 degrees above the west-northwestern horizon, at a -0.5, not bad!

After midnight, Jupiter is up and glittering at a -2.6 with Uranus at a feeble 5.8 in apparent brightness. According to ASTRONOMY magazine (July 2010), during the early part of July, observe Jupiter using binoculars. Place Jupiter near the left side of you field of view and to its right, you should see a pair of 6th magnitude objects. The one that is farther one, is Uranus—Good Luck! Believe it or not but the Earth is at its farthest point from the sun on July 6th, 2010, at a distance of 94,508,000 miles or 1.67% farther than the average. Will Wonders never cease?

★★★

The moon was over in the SE, a faint hint that it was waning, but still fairly bright. ***Mars*** *was close to setting with* ***Venus,*** *extremely bright over near the constellation LEO, (west of its neck) in the western evening sky. Located in the constellation of* ***VIRGO,*** *(kind of northwest) is Saturn and Jupiter is just east, and up from the star* ***SPICA****. The time is 9:00 PM; date is June 30th 1863, the geographic location is North America and more specifically, in the state called PENNSYLVANIA, in a town called GETTYSBURG. By 10:00 PM the sky was ablaze with stars with the constellation* ***HERCULES****, at the ZENITH and the Milky Way galaxy over in the eastern part of the summer night sky and very visible. The moon was now over in the SSW part of the predawn sky, around 3:00 AM. The Milky Way galaxy appeared over the zenith travelling*

from the NE toward the SW. The star VEGA in the constellation LYRA was very bright and noticeable, if anyone cared to observe it. This day was to be the FIRST BATTLE of GETTYSBURG, and for many of the soldiers and civilians of Gettysburg; this would be their last morning and day to be alive. The celestial bodies above cared not for the happenings that were to take place on this day, or the other days to follow.

*By the end of the first day at Gettysburg, the moon was moving a bit north, but near the constellation of **SAGITTARIUS**. A bit more of the moon was receiving less light from the Sun, and of course Venus was getting close to the western horizon; the time was between 9:00 and 10:00 PM. At 3:00 AM, July 2nd, the moon was now in the SW part of the predawn sky with the constellation **CAPRICORNUS** to its left or East from it. Again, the universe lay witness to the terrible carnage that would befall both sides of this brutal war. It was the day when the farthest left flank of the Union's position would hold, with a philosophy professor in command, from the State of MAINE. It was now over, and between 9:00 and 10:00 PM of the 2nd of July 1863 the moon was rising over in the SE and had moved into the constellation of **CAPRICORNUS.** A person wonders, did any of these people take the time to look up into the cosmos and sky themselves; "what the hell is going on here and does the Universe even know, or even care as to what is going on this bloody battlefield?"*

At 3:00 AM of the 3rd of July, the moon was now just a bit to the west of the Median Line that separates the sky between the Eastern half and the Western half. A bit more of it was getting less light from the sun but it still shone its brightness over the land below it. Today would be the last day of this battle between the forces of the Union and the Confederate Forces. The Union lines had held, and now Lee would attempt a mass charge, over one mile in line, with a force of over 13,000 foot-soldiers walking a distance of over two miles, and to try and penetrate the Union front line; it would be known as Picket's Charge. He also had sent Jeb Stuart around the Union position. The plan was to attack the Union's backside with a force of at least 5,000 Cavalry; What he and Jeb Stuart did not know was there was a force of 500 Union cavalry that would intercept them. That unit, the MICHIGAN BRIGADE, was under the command of one of the Union's brightest and youngest Brigadier Generals, George Armstrong Custer.

It was now between 9:00 and 10:00 PM, July 3rd 1863. Lee had lost, Picket, when Lee had told him to regroup his division, after his ill-fated attack, replied to Lee that "he had no Division". It was reported that it sounded like a "thunderous crash of a giant falling tree" that afternoon behind the Union rear, when the Michigan charged right into the Jeb Stuart's cavalry. General George Armstrong Custer had beaten the top Cavalry Commander of the Confederate Army. Lee's Army marched back toward the South, never to invade the Union again. The commander of the Union, knew they had won, but at a cost. When Lee later surrendered his army at Appomattox, the table which Grant and Lee signed the surrender documents was given to Custer's wife, Libbie by General Phillip Sheridan.

★★★

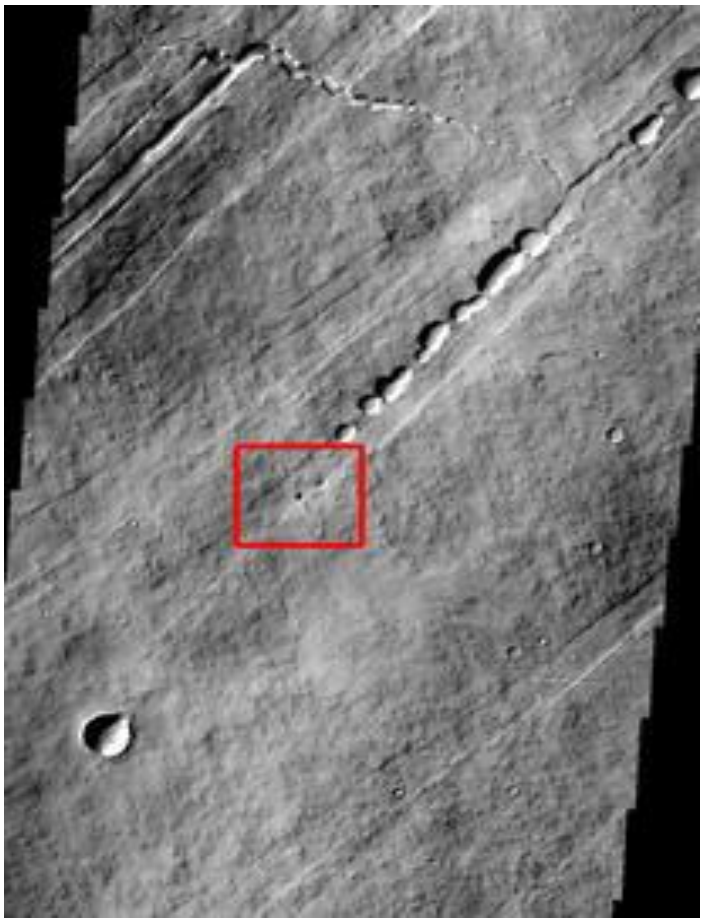
A POSTSCRIPT: According to the recent book 'THE LAST STAND', by Nathaniel Philbrick, he mentions that a great-grandson of Sitting Bull, a Mr. Ernie LaPointe, was a wounded veteran of the Vietnam War where he served with the Screaming Eagles of the 101st Airborne Division. He also holds no grudges, and according to Mr. Philbricks' book; Mr. LaPointe: "Sitting Bull didn't dislike Custer; he realized he was a military guy following orders"

– *John Goerger*

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

MIDDLE-SCHOOL PROJECT DISCOVERS MARS CAVE SKYLIGHT

They went looking for lava tubes on Mars — and found what may be a hole in the roof of a Martian cave. The 16 students in Dennis Mitchell's 7th-grade science class at Evergreen Middle School in Cottonwood, CA, chose to study lava tubes, a common volcanic feature on Earth and Mars. It was their class project for the Mars Student Imaging Program (MSIP), a component of ASU's Mars Education Program. The imaging program involves upper elementary to college students in Mars research by having them develop a geological question to answer about Mars. Then the students actually command a Mars-orbiting camera to take an image to answer their question. Since MSIP began in 2004, more than 50,000 students have participated to varying extents. "*The students developed a research project focused on finding the most common locations of lava tubes on Mars*," Mitchell said. "*Do they occur most often near the summit of a volcano, on its flanks, or the plains surrounding it?*"



Cave Entrance into Martian lava tube. Mars Odyssey Orbiter image.

To answer the question, the students examined more than 200 images of Mars taken with the Thermal Emission Imaging System (THEMIS), an instrument on Mars Odyssey orbiter. Philip Christensen is the instrument's designer and principal investigator. The students chose for their targeted THEMIS image (plus a secondary backup image) areas on Pavonis Mons volcano that had yet to be photographed by THEMIS at highest resolution (18 meters, or 59 feet, per pixel). On their two targeted images the students found lava tubes, as they had hoped. And on the backup image, they also found a small, round black spot. Many Martian lava tubes are marked by aligned chains of collapse pits, which

typically have flat floors and sloping sides. The spot the students found, however, appears to have vertical sides.

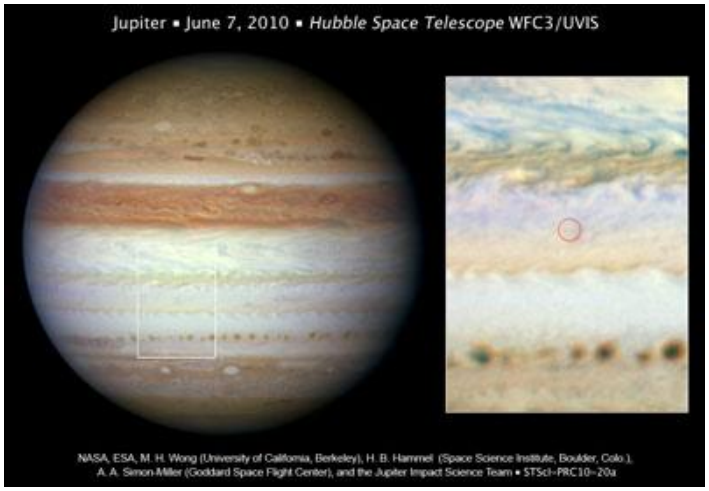
Such features made a stir in the news in 2007, when Glen Cushing, a USGS scientist, published a paper showing several Martian examples, which had been located using the heat-sensing capability of THEMIS. He argued that these holes were anomalous as compared to the usual chain pit crater, being smaller and resembling a relatively straight-sided shaft going down into the ground. Cushing proposed that these anomalous pit craters are "skylights" – places where a small part of the roof of a cave or a lava tube had collapsed, opening the subsurface to the sky. They typically appear cooler than the ground surface by day, but warmer than it by night. This is exactly what would be expected, given that Martian surface temperatures have a large diurnal range, while subsurface temperatures hold fairly even.

"*This pit is certainly new to us*," Cushing told the students. "*And it is only the second one known to be associated with Pavonis Mons*." He estimated it to be approximately 190-by-160 meters (620x520 feet) wide and 115 meters (380 feet) deep at least. In addition, he said, the spot appears clear against the background surface of Pavonis Mons. "*It sticks out like a sore thumb in THEMIS predawn thermal observations*."

The students have submitted their site as a candidate for imaging by the High Resolution Imaging Science Experiment (HiRISE) camera on Mars Reconnaissance Orbiter. HiRISE can image the surface at about 30 centimeters (12 inches) per pixel, which may allow a look inside the hole in the ground. "*The Mars Student Imaging Program is certainly one of the greatest educational programs ever developed*," Mitchell said. "*It gives the students a good understanding of the way research is conducted and how that research can be important for the scientific community. This has been a wonderful experience*."

MYSTERIOUS FLASH ON JUPITER LEFT NO DEBRIS CLOUD

Detailed observations made by Hubble Space Telescope have found an answer to the flash of light seen June 3 on Jupiter. It came from a giant meteor burning up high above Jupiter's cloud tops. The space visitor did not plunge deep enough into the atmosphere to explode and leave behind any telltale cloud of debris, as seen in previous Jupiter collisions. Astronomers around the world knew that something must have hit the giant planet to unleash a flash of energy bright enough to be seen 400 million miles away. But they didn't know how deeply it penetrated into the atmosphere. There have been ongoing searches for the "black-eye" pattern of a deep direct hit.



The sharp vision and ultraviolet sensitivity of Hubble's Wide Field Camera 3 were brought to bear on seeking out any trace evidence of the aftermath of the cosmic collision. Images taken on June 7 -- just over three days after the flash was sighted -- show no sign of debris above Jupiter's cloud tops. This means that the object didn't descend beneath the clouds and explode as a fireball. "*If it did, dark sooty blast debris would have been ejected and would have rained down onto the cloud tops, and the impact site would have appeared dark in the ultraviolet and visible images due to debris from an explosion*," says team member Heidi Hammel of the Space Science Institute in Boulder, Colo. "*We see no feature that has those distinguishing characteristics in the known vicinity of the impact, suggesting there was no major explosion and fireball*."

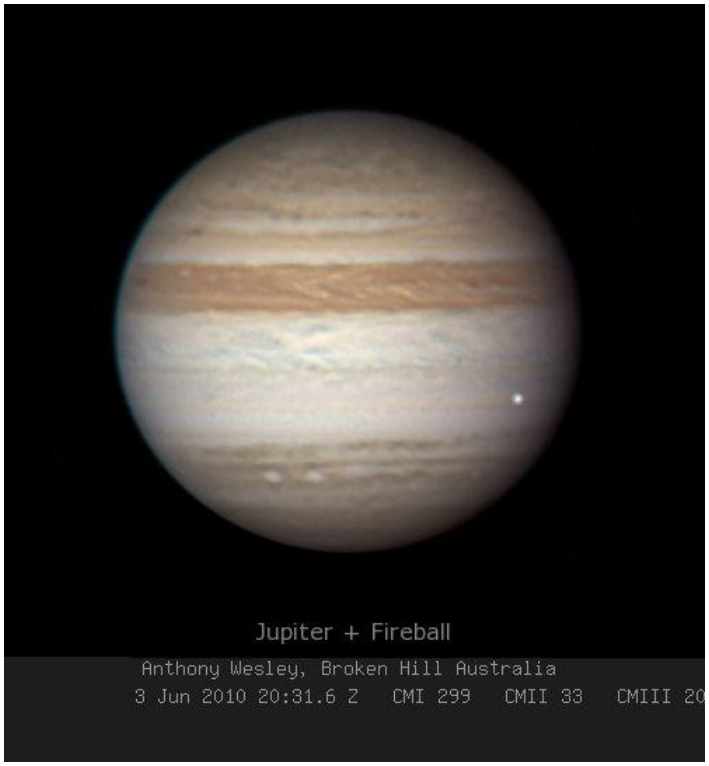


Photo credit: *Anthony Wesley, Broken Hill Australia*

Dark smudges marred Jupiter's atmosphere when a series of comet fragments hit Jupiter in July 1994. A similar phenomenon occurred in July 2009 when a suspected asteroid slammed into Jupiter. The latest intruder is estimated to be only a fraction the size of these previous impactors. "*We suspected for this 2010 impact there might be no big explosion driving a giant plume, and hence no resulting debris field to be imaged. There was just the meteor, and Hubble confirmed this*," adds Hammel, a veteran Jupiter observer of the 1994 string of impacts. Australian amateur astronomer Anthony Wesley saw the flash at 4:31 p.m. (EDT) on June 3. He was watching a live video feed of Jupiter from his telescope. In the Philippines, amateur astronomer Chris Go confirmed that he had simultaneously recorded the transitory event on video. The two-second-long flash of light in the videos of Jupiter was created by the same physics that causes a meteor (or "shooting star") on Earth. A shock wave generated by ram pressure as the meteor speeds into the planet's atmosphere heats the impacting body to a very high temperature, and as the hot object streaks through the atmosphere, it leaves behind a glowing trail of superheated atmospheric gases and vaporized meteor material that rapidly cools and fades in just a few seconds.

Though astronomers are largely uncertain about the rate of large meteoroid impacts on the planets, the best guess for Jupiter is that the smallest detectable events may happen as frequently as every few

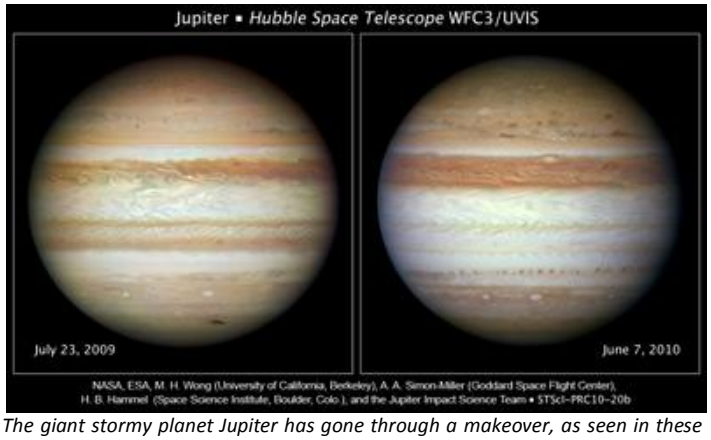
weeks. "*The meteor flashes are so brief they are easily missed, even in video recordings, or perhaps misidentified as detector noise or cosmic ray hits on imaging devices*," says team member Mike Wong.

"*It's difficult to even know what the current impact rates are throughout the solar system. That's partly why we are so excited by the latest impact. It illustrates a new capability that can be exploited with increased monitoring of Jupiter and the other planets*," says Amy Simon-Miller, the principal investigator on the Jupiter observation. http://hubblesite.org/news/2010/20 * http://www.nasa.gov/hubble

JUPITER LOSES A BELT SYSTEM – FOR NOW

Jupiter has 'lost' its South Equatorial Belt (SEB) at least temporarily. It has changed appearance a great deal since last fall, as a comparison of Hubble images shows (below). It is believed that the belts may actually still be present, but covered by a high thin layer of white clouds. As a bonus while looking for remnants of the flash imact, the Hubble observations also allowed scientists to get a close-up look at changes in Jupiter's atmosphere following the disappearance of the dark Southern Equatorial Belt (SEB) several months ago. In the Hubble view, a slightly higher altitude layer of white ammonia ice crystal clouds appears to obscure the deeper, darker belt clouds. "*Weather forecast for Jupiter's South Equatorial Belt: cloudy with a chance of ammonia*," Hammel says.

The team predicts that these ammonia clouds should clear out in a few months, as it has done in the past. The clearing of the ammonia cloud layer should begin with a number of dark spots like that seen by Hubble along the boundary of the south tropical zone. "*The Hubble images tell us these spots are holes resulting from localized downdrafts taking place. We often see these types of holes when a change is about to occur*," Simon-Miller says. "*The SEB last faded in the early 1970s. We haven't been able to study this at this level of detail before," Simon-Miller adds. "The changes of the last few years are adding to an extraordinary database on dramatic cloud changes on Jupiter*."



The giant stormy planet Jupiter has gone through a makeover, as seen in these comparative Hubble Space Telescope images taken nearly 11 months apart. Several months ago the dark Southern Equatorial Belt (SEB) vanished. The last time this happened was in the early 1970s, when we didn't have powerful enough telescopes to study the change in detail.

Left - A Hubble picture from July 23, 2009, captures the planet's common appearance over the past several decades with alternating zones of high altitude ammonia ice crystal clouds (white strips) and belts of lower altitude material (dark strip). The image was taken to study a wispy patch of dark debris in the far Southern Hemisphere caused by the suspected explosion of an asteroid plunging into the lower atmosphere on July 19, 2009.

Right - A Hubble picture from June 7, 2010, reveals a slightly higher altitude layer of white ammonia ice crystal clouds that appears to obscure the deeper, darker belt clouds of the SEB. The team predicts that these clouds should clear out in a few months. Hubble also resolved a string of dark spots farther south of the vanished belt. Based on past observations, the Hubble Jupiter team expects to see similar spots appear in the SEB, right before its white clouds clear out in a few months. These natural color comparative planet portraits were taken in visible light with Hubble's new Wide Field Camera 3. Credit: NASA, ESA, M.H. Wong (University of California, Berkeley), A.A. Simon-Miller (Goddard Space Flight Center), H.B. Hammel (Space Science Institute, Boulder, Colo.), and the Jupiter Impact Science Team

KEPLER DATA ON POTENTIAL EXTRASOLAR PLANETS

The Kepler mission has released 43 days of science data on more than 156,000 stars. These stars are being monitored for subtle brightness changes as part of an ongoing search for Earth-like planets outside of our solar system. Astronomers will use the new data to determine if orbiting planets are responsible for brightness variations in several hundred stars. These stars make up a full range of temperatures, sizes and ages. Many of them are stable, while others pulsate. Some show starspots, which are similar to sunspots, and a few produce flares that would sterilize their nearest planets.

Kepler, a space observatory, looks for the data signatures of planets by measuring tiny decreases in the brightness of stars when planets cross in front of, or transit them. The size of the planet can be derived from the change in the star's brightness. The 28-member Kepler science team also is using ground-based telescopes and the Hubble Space Telescope and Spitzer Space Telescope to perform follow-up observations on a specific set of 400 objects of interest. The star field that Kepler observes in the constellations Cygnus and Lyra can only be seen from ground-based observatories in spring through early fall. The data from these other observations will determine which of the candidates can be identified as planets. That data will be released to the scientific community in February 2011.

Without the additional information, candidates that are actual planets cannot be distinguished from false alarms, such as binary stars -- two stars that orbit each other. The size of the planetary candidates also can be only approximated until the size of the stars they orbit is determined from additional spectroscopic observations made by ground-based telescopes. "*I look forward to the scientific community analyzing the data and announcing new exoplanet results in the coming months*," said Lia LaPiana, Kepler's program executive. "*This is the most precise, nearly continuous, longest and largest data set of stellar photometry ever*," said Kepler Deputy Principal Investigator David Koch. "*The results will only get better as the duration of the data set grows with time*."

Kepler will continue conducting science operations until at least November 2012, searching for planets as small as Earth, including those that orbit stars in a warm habitable zone where liquid water could exist on the surface of the planet. Since transits of planets in the habitable zone of solar-like stars occur about once a year and require three transits for verification, it is expected to take at least three years to locate and verify an Earth-size planet.

"*The Kepler observations will tell us whether there are many stars with planets that could harbor life, or whether we might be alone in our galaxy*," said mission science principal investigator William Borucki. http://archive.stsci.edu/kepler http://www.nasa.gov/kepler

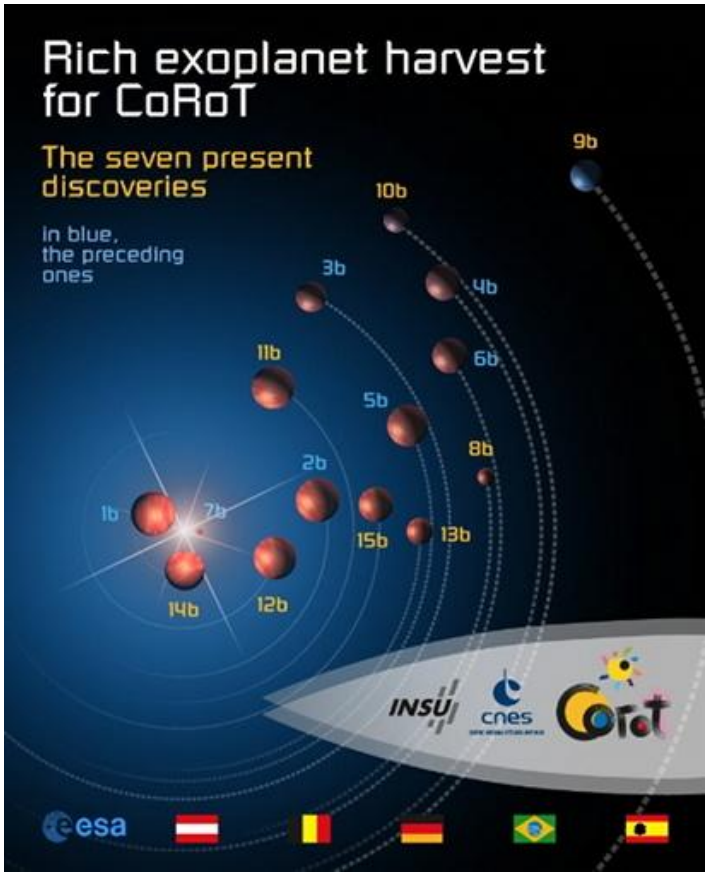
COROT UNVEILS A RICH ASSORTMENT OF NEW EXOPLANETS

By detecting the faint dimming in the light emitted by stars during a transit event, CoRoT has detected six new exoplanets - each with its own peculiar characteristics - and one brown dwarf. One of these exoplanets, designated CoRoT-11b, has twice the mass of Jupiter and orbits a rapidly rotating star; this type of star is an extremely difficult target for exoplanet searches and its detection marks a significant

achievement for the CoRoT team. In order to detect planets orbiting other suns, the CoRoT satellite, which is operated by CNES (the French space agency), observes a large number of stars over a significant period of time, trying to spot a subtle decrease in their luminosity: this 'dimming' could be a signature that the star hosts a planet, which is transiting in front of it and partially obscuring its light. This transit technique is one of several methods used to search for exoplanets but is the only one that allows astronomers to determine the radius of the planet - by measuring the depth of the transit.

Other geometrical configurations of a stellar system, for instance the presence of one or more companion stars can, however, mimic the presence of a planet. For this reason follow-up observations are needed to confirm the planetary nature of the transiting body. Alerted by CoRoT's detection of a candidate planet-hosting star, some of the foremost ground-based observatories collect high-resolution images and spectra, yielding a wealth of additional information.

In particular, astronomers look for a Doppler shift in the stellar spectrum, highlighting the periodic 'wobble' of the star in the two-body system. From the amplitude of this wobble, it is possible to estimate the mass of the transiting body and, consequently, to determine whether or not it is indeed a planet. Once the mass and the radius are known, the mean density of the planet can be derived – a key factor in distinguishing between gaseous giant planets and rocky terrestrial ones. The discovery of these six new exoplanets adds variety to the large number of exoplanets that have been detected to date.

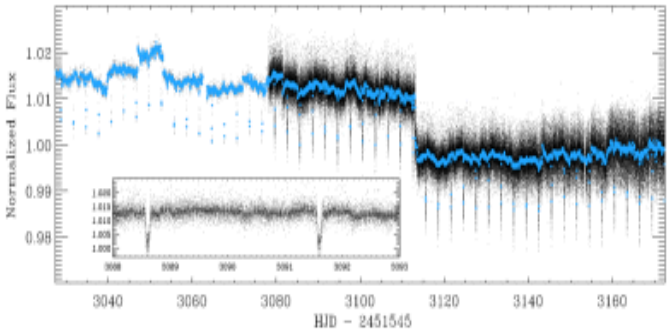


"*With the addition of this new batch, the number of exoplanets discovered by CoRoT has risen to 15*," says Magali Deleuil, head of the CoRoT exoplanet program. "*The increasing size of the census, which includes objects with very diverse characteristics, is of vital importance for a better understanding of planetary systems other than our own*," she adds.

The new discoveries exhibit a wide variety of physical properties, spanning a broad range of sizes and masses: the smallest of the sample, CoRoT-8b, is about 70% of Saturn's size and mass, while CoRoT-10b, CoRoT-11b, CoRoT-12b, CoRoT-13b and CoRoT-14b are larger, belonging to the class known as 'hot Jupiters'. CoRoT-15b, being 60 times as massive as Jupiter, is a brown dwarf, an intermediate object between a planet and a star. In addition, other peculiarities are exhibited in this very heterogeneous set of exoplanets: CoRoT-10b has an extremely eccentric orbit, resulting in large variations in its surface temperature over the course of its year, and CoRoT-11b's parent star spins around its axis at an extraordinarily fast rate.

"*The rich diversity emerging from this sample is a very interesting result, showing CoRoT's ability to detect exoplanets which are rather different from each other*", comments Malcolm Fridlund, Project Scientist for CoRoT. "*Being able to study a wide variety of planets will provide important insights into the formation and evolution of planetary systems*", he adds. One of the planets, CoRoT-11b, stands out from the set of six because of the rotation velocity of CoRot-11, its parent star, which spins around its axis in less than 2 days - an exceptionally high speed, as compared to the Sun's rotation period of about 26 days. "*This is the third exoplanet discovered around such a rapidly rotating star*", notes Davide Gandolfi, who led the study of CoRoT-11b. "*Because of the fast rotation of its host star, such a planet could only have been discovered because it transits in front of it, thus only a transit-hunter, such as CoRoT, could have spotted it*", he adds.

The search for Doppler shifts in the spectra of stars, which represents another prolific method for detecting exoplanets, is in fact biased against planets orbiting fast rotators, as the high rotational velocity of the star makes it extremely hard to achieve high-precision Doppler measurements and hence to detect the tiny signature of the presence of a planet. "*If it had been included as a possible exoplanet candidate during such a campaign, CoRoT-11b would have been rejected because of the intensive observational effort needed to achieve the required accuracy*", explains Gandolfi.

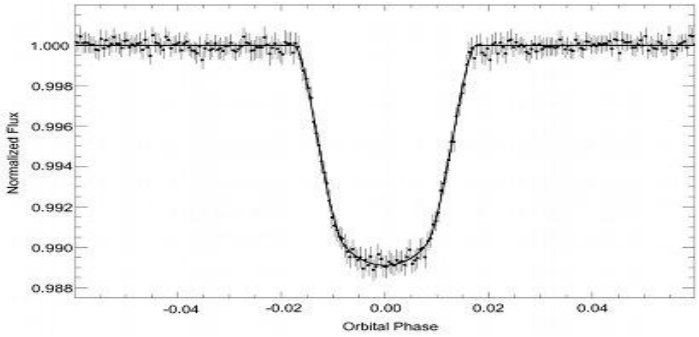


The complete lightcurve of CoRoT-11 for the period 15 April to 7 September 2008.

Instead, the object was first noticed by CoRoT, and then became the subject of extensive photometric and spectroscopic follow-up observations across the world, using the Swiss Leonhard Euler 1.2 m telescope at ESO's La Silla Observatory and the TEST 30 cm telescope at the Thüringer Landessternwarte Tautenburg, as well as a number of world-class spectrographs (HARPS at ESO's La Silla Observatory, SOPHIE at the Haute-Provence Observatory, UVES at the ESO Very Large Telescope and HIRES at the Keck Observatory), and the high- and low-resolution spectrograph also at Tautenburg, in Germany.

Thanks to the combination of these exceptional data, it was possible to estimate the mass of CoRoT-11b, which is about twice as massive as

Jupiter, and its radius, which is about 1.4 times that of Jupiter, thus confirming its planetary nature. "*This result anticipates what may be achieved by future space-based missions searching for exoplanets*", says Fridlund. CoRoT is in fact a precursor for PLATO, a Cosmic Vision candidate mission that will seek planetary transits over a much larger sample of stars - the size of the sample is an important factor determining the number of planets that may be discovered. This significant increase in the sample size is possible because of PLATO's very wide field of view, which in turn relies on the combined use of 34 small telescopes. In addition, PLATO will study brighter stars than those that can be observed with CoRoT, making it possible to determine the age of the planet-hosting stars through asteroseismology measurements.



The folded lightcurve, showing the amplitude of the transit. Images courtesy of D. Gandolfi.

This, combined with the tremendous improvement in the accuracy on the estimate of exoplanet masses and sizes that is expected from PLATO, will provide an important step in the quest to understand the conditions that favor the formation of Earth-like planets.

Since 1995, astronomers have discovered over 450 exoplanets by employing a number of techniques, including astrometry, radial velocity and the transit method. Of the 82 planets that have been discovered using the transit method, 15 were first spotted by CoRoT. http://sci.esa.int/science-e/www/object/index.cfm?fobjectid=47175

Water Content of Moon Interior Underestimated

Scientists estimate from recent research that the volume of water molecules locked inside minerals in the moon's interior could exceed the amount of water in the Great Lakes here on Earth. The scientists determined that the water was likely present very early in the moon's formation history as hot magma started to cool and crystallize. This finding means water is native to the moon. "*For over 40 years we thought the moon was dry*," said Francis McCubbin, lead author of the report. "*In our study we looked at hydroxyl, a compound with an oxygen atom bound with hydrogen, and apatite, a water-bearing mineral in the assemblage of minerals we examined in two Apollo samples and a lunar meteorite*."

McCubbin's team utilized tests which detect elements in the parts per billion range. Combining their measurements with models that characterize how the material crystallized as the moon cooled during formation, they found that the minimum water content ranged from 64 parts per billion to 5 parts per million. The result is at least two orders of magnitude greater than previous results from lunar samples that estimated water content of the moon to be less than 1 parts per billion.

"*In this case, when we talk about water on the moon, we mean water in the structural form hydroxyl*," said Jim Green, director of the Planetary Science Division at NASA. "*This is a very minor component of the rocks that make up the lunar interior*."

The origin of the moon is now commonly believed to be the result of a Mars-sized object that impacted the Earth 4.5 billion years ago. This impact put a large amount of material into Earth's orbit that ultimately compacted to form the moon. The lunar magma ocean that is thought to have formed at some point during the compacting process, began to cool. During this cooling, water either escaped or was preserved as hydroxyl molecules in the crystallizing minerals. Previous studies found evidence of water both on the lunar surface and inside the moon by using respectively, remote sensing data from the Indian spacecraft Chandrayaan-1 and other lunar sample analysis.

Researchers looked within crystalline rocks called KREEP (K for potassium; REE, for rare Earth elements; and P for phosphorus). These rocks are a component of some lunar impact melt and basaltic rocks. "*Since water is insoluble in the main silicates that crystallized, we believed that it should have concentrated in those rocks*," said Andrew Steele of Carnegie and co-author of the report. "*That's why we selected KREEP to analyze*."

The identification of water from multiple types of lunar rocks that display a range of incompatible trace element signatures indicates that water may be at low concentrations but ubiquitous within the moon's interior, potentially as early as the time of lunar formation and magma ocean crystallization. "*It is gratifying to see this proof of the hydroxyl contents in lunar apatite*," said lunar scientist Bradley Jolliff. "*The concentrations are very low and, accordingly, they have been until recently nearly impossible to detect. We can now finally begin to consider the implications - and the origin - of water in the interior of the moon*." http://www.nasa.gov

Ancient Ocean May Have Covered One-Third of Mars

A vast ocean likely covered one-third of the surface of Mars some 3.5 billion years ago, according to a new study. The study is the first to combine the analysis of water-related features including scores of delta deposits and thousands of river valleys to test for the occurrence of an ocean sustained by a global hydrosphere on early Mars. While the notion of a large, ancient ocean on Mars has been repeatedly proposed and challenged over the past two decades, the new study provides further support for the idea of a sustained sea on the Red Planet during the Noachian era more than 3 billion years ago, said researcher Gaetano Di Achille, lead author on the study.

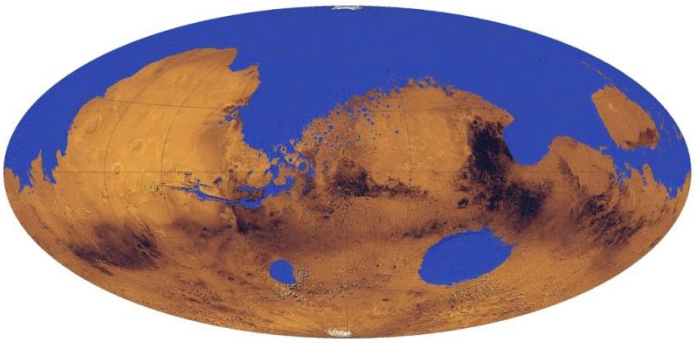


Image credit: University of Colorado

More than half of the 52 river delta deposits identified by the researchers in the new study -- each of which was fed by numerous river valleys -- likely marked the boundaries of the proposed ocean, since all were at about the same elevation. Twenty-nine of the 52 deltas were connected either to the ancient Mars ocean or to the groundwater table of the ocean and to several large, adjacent Di Achille said.

The study is the first to integrate multiple data sets of deltas, valley networks and topography from a cadre of orbiting missions of Mars dating back to 2001, said Hynek. The study implies that ancient Mars probably had an Earth-like global hydrological cycle, including precipitation, runoff, cloud formation, and ice and groundwater accumulation, Hynek said. Di Achille and Hynek used a geographic information system, or GIS, to map the Martian terrain and conclude the ocean likely would have covered about 36 percent of the planet and contained about 30 million cubic miles, or 124 million cubic kilometers, of water. The amount of water in the ancient ocean would have formed the equivalent of a 1,800-foot, or 550-meter-deep layer of water spread out over the entire planet. The volume of the ancient Mars ocean would have been about 10 times less than the current volume of Earth's oceans, Hynek said. Mars is slightly more than half the size of Earth.

The average elevation of the deltas on the edges of the proposed ocean was remarkably consistent around the whole planet, said Di Achille. In addition, the large, ancient lakes upslope from the ancient Mars ocean likely formed inside impact craters and would have been filled by the transport of groundwater between the lakes and the ancient sea, according to the researchers.

A second study headed by Hynek and involving researcher Michael Beach of LASP and doctoral student Monica Hoke being published in the Journal of Geophysical Research-Planets -- a publication of the American Geophysical Union -- detected roughly 40,000 river valleys on Mars. That is about four times the number of river valleys that have previously been identified by scientists, said Hynek.

The river valleys were the source of the sediment that was carried downstream and dumped into the deltas adjacent to the proposed ocean, said Hynek. "*The abundance of these river valleys require significant amount of precipitation*," he said. "*This effectively puts a nail in the coffin regarding the presence of past rainfall on Mars*." Hynek said an ocean was likely required for the sustained precipitation.

"*Collectively, these results support the existing theories regarding the extent and formation time of an ancient ocean on Mars and imply the surface conditions during the time probably allowed the occurrence of a global and active hydrosphere integrating valley networks, deltas and a vast ocean as major components of an Earth-like hydrologic cycle*," Di Achille and Hynek wrote.

"*One of the main questions we would like to answer is where all of the water on Mars went*," said Di Achille. He said future Mars missions -- including the $485 million 'Mars Atmosphere and Volatile EvolutioN' mission, or MAVEN, which is slated to launch in 2013 -- should help to answer such questions and provide new insights into the history of Martian water.

The river deltas on Mars are of high interest to planetary scientists because deltas on Earth rapidly bury organic carbon and other biomarkers of life and are a prime target for future exploration. Most astrobiologists believe any present indications of life on Mars will be discovered in the form of subterranean microorganisms. "*On Earth, deltas and lakes are excellent collectors and preservers of signs of past life*," said Di Achille. "*If life ever arose on Mars, deltas may be the key to unlocking Mars' biological past*." Hynek said long-lived oceans may have provided an environment for microbial life to take hold on Mars.

ZOOMING IN ON AN INFANT SOLAR SYSTEM

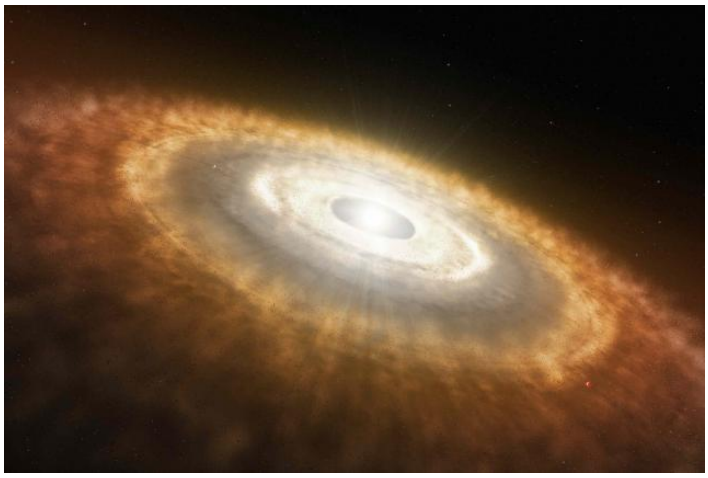
A team led by astronomer Joshua Eisner has observed in unprecedented detail the processes giving rise to stars and planets in nascent solar systems. The discoveries provide a better understanding of the way hydrogen gas from the protoplanetary disk is incorporated into the star. By coupling both Keck telescopes on Mauna Kea in Hawaii with a specifically engineered instrument named ASTRA (ASTrometric and phase-Referenced Astronomy), Eisner and his colleagues were able to peer deeply into protoplanetary disks - swirling clouds of gas and dust that feed the growing star in its center and eventually coalesce into planets and asteroids to form a solar system.

The big challenge facing Eisner's team lies in obtaining the extremely fine resolution necessary to observe the processes that happen at the boundary between the star and its surrounding disk - 500 light years from Earth. It's like standing on a rooftop in Tucson trying to observe an ant nibbling on a grain of rice in New York's Central Park.

"*The angular resolution you can achieve with the Hubble Space Telescope is about 100 times too coarse to be able to see what is going on just outside of a nascent star not much bigger than our sun*," said Eisner. In other words, even a protoplanetary disk close enough to be considered in the neighborhood of our solar system would appear as a featureless blob.

Combining the light from the two Keck telescopes provides an angular resolution finer than Hubble's. Eisner and his team used a technique called spectro-astrometry to boost resolution even more. By measuring the light emanating from the protoplanetary disks at different wavelengths with both Keck telescope mirrors and manipulating it further with ASTRA, the researchers achieved the resolution needed to observe processes in the centers of the nascent solar systems.

Protoplanetary disks form in stellar nurseries when clouds of gas molecules and dust particles begin to collapse under the influence of gravity. Initially rotating slowly, the cloud's growing mass and gravity cause it to become more dense and more compact. The preservation of rotational momentum speeds up the cloud as it shrinks, much like a figure skater spins faster as she tugs in her arms. The centrifugal force flattens the cloud into a spinning disk of swirling gas and dust, eventually giving rise to planets orbiting their star in roughly the same plane.



Like a raindrop forming in a cloud, a star forms in a diffuse gas cloud in deep space. As the star grows, its gravitational pull draws in dust and gas from the surrounding molecular cloud to form a swirling disk called a "protoplanetary disk." This disk eventually further consolidates to form planets, moons, asteroids and comets. (Credit: NASA/JPL-Caltech)

Combining the Keck interferometer with the spectro-astrometry technique, Eisner and his collaborators were able to distinguish between the distributions of gas, mostly made up of hydrogen, and dust, thereby resolving the disk's features. "*We were able to get really, really close to the star and look right at the interface between*

the gas-rich protoplanetary disk and the star," said Eisner, who serves as project scientist on the ASTRA team.

Astronomers know that stars acquire mass by incorporating some of the hydrogen gas in the disk that surrounds them, in a process called accretion. "*We want to understand how material accretes onto the star*," Eisner said. "*This process has never been measured directly*." Accretion can happen in one of two ways. In one scenario, gas is swallowed as it washes up right to the fiery surface of the star. In the second, much more violent scenario, the magnetic fields sweeping from the star push back the approaching gas and cause it to bunch up, creating a gap between the star and its surrounding disk. Rather than lapping at the star's surface, the hydrogen atoms travel along the magnetic field lines as if on a highway, becoming super-heated and ionized in this process.

"*Once trapped in the star's magnetic field, the gas is being funneled along the field lines arching out high above and below the disk's plane*," Eisner explained. "*The material then crashes into the star's polar regions at high velocities*." In this inferno, which releases the energy of millions of Hiroshima-sized atomic bombs every second, some of the arching gas flow is ejected from the disk and spews out far into space as interstellar wind.

Eisner's team pointed the telescopes at 15 protoplanetary disks with young stars varying in mass between one half and 10 times that of our sun. This sample of disks, all located in our own galaxy, the Milky Way, represents by far the largest of its kind.

"*We could successfully discern that in most cases, the gas converts some of its kinetic energy into light very close to the stars*" he said, a tell-tale sign of the more violent accretion scenario. "*In other cases, we saw evidence of winds launched into space together with material accreting on the star*," Eisner added. "*We even found an example – around a very high-mass star – in which the disk may reach all the way to the stellar surface*."

The solar systems the astronomers chose for this study are still young, probably a few million years old. "*These disks will be around for a few million years more*," Eisner said. "*By that time, the first planets, gas giants similar to Jupiter and Saturn, may form, using up a lot of the disk material*." More solid, rocky planets like the Earth, Venus or Mars, won't be around until much later. "*But the building blocks for those could be forming now*," he said, which is why this research is important for our understanding of how solar systems form, including those with potentially habitable planets like Earth. "*We are going to see if we can make similar measurements of organic molecules and water in protoplanetary disks*," he said. "*Those would be the ones potentially giving rise to planets with the conditions to harbor life*." http://uanews.org/node/32352

NASA Invites Public to Picture Their "Face in Space"

NASA is inviting members of the public to send electronic images of their faces into orbit aboard one of the final remaining space shuttle missions. Visitors to the "Face in Space" website can upload their portrait to fly with the astronauts aboard shuttle Discovery's STS-133 mission and/or shuttle Endeavour's STS-134 mission. Participants will receive special certificates from the Internet site once the mission is completed. "*The Space Shuttle Program belongs to the public, and we are excited when we can provide an opportunity for people to share the adventure of our missions*," said Space Shuttle Program Manager John Shannon. "*This website will allow you to be a part of history and participate as we complete our final missions*." To submit your image, visit: http://faceinspace.nasa.gov Those without a picture can skip the image upload section, and NASA will fly their name.

Mapping Reinforces Belief in Huge Seas on Mars

A geologic mapping project using spacecraft data offers new evidence that expansive lakes existed long ago on Mars. The research points to a series of sedimentary deposits consistent with what would relate to large standing bodies of water in Hellas Planitia located in the southern hemisphere of Mars, said by Dr. Leslie Bleamaster, research scientist at the Planetary Science Institute. Fine-layered outcrops around the eastern rim of Hellas have been interpreted as a series of sedimentary deposits resulting from erosion and transport of highland rim materials into a basin-wide standing body of water, Bleamaster said. Hellas basin, more than 2,000 km across and 8 km deep, is the largest recognized impact structure on the Martian surface, he said.

The mapping project reinforces earlier research that initially proposed Hellas-wide lakes citing different evidence in the west, he said. The new map and accompanying map pamphlet may be found at http://pubs.usgs.gov/sim/3096/ "*This mapping makes geologic interpretations consistent with previous studies, and constrains the timing of these putative lakes to the early-middle Noachian period on Mars, between 4.5 and 3.5 billion years ago*," he said.

A systematic search of high-resolution images revealed that eastern Hellas Planitia, where the fine-layered floor deposits were discovered, is unique in nature representing a confluence between sedimentary sources and sinks. The circum-Hellas highlands represent a significant percentage of the southern hemisphere of Mars and have served as a locus for volcanic and sedimentary activity throughout Martian geologic time. Hellas Planitia preserves the materials shed from these highlands and holds the key to further unraveling some of Mars' long held secrets. "*Our mapping and evaluation of landforms and materials of the Hellas region from the basin rim to floor provides further insight into Martian climate regimes and into the abundance, distribution, and flux of volatiles through history*," Bleamaster said.

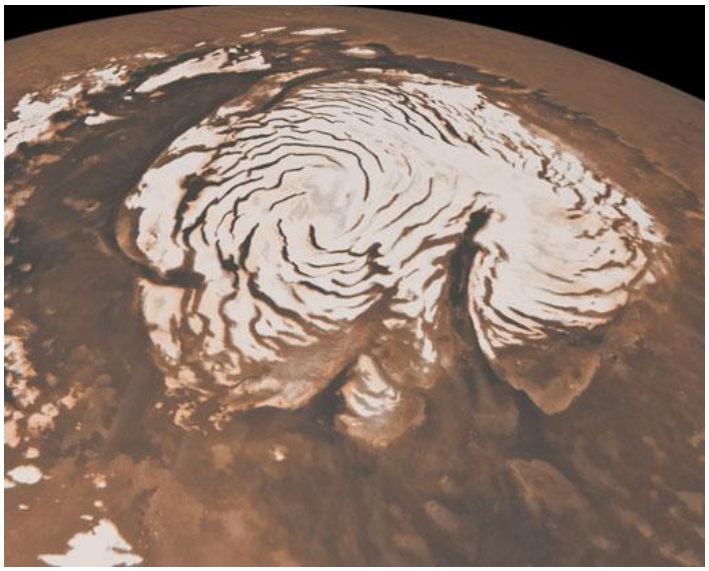
The geologic mapping was published at 1:1,000,000 scale and used Viking Orbiter, Thermal Emission Imaging System (THEMIS) - infrared (IR) and visible (VIS) wavelength, and Mars Orbiter Camera (MOC) narrow-angle images, combined with Mars Orbiter Laser Altimeter (MOLA) topographic data, to characterize the geologic materials and processes that have shaped this region and was supported through NASA's Planetary Geology and Geophysics program.

Spacecraft Penetrates Mysteries of Martian Ice Cap

Data from Mars Reconnaissance Orbiter (MRO) have helped scientists solve a pair of mysteries dating back four decades and provided new information about climate change on the Red Planet. The Shallow Radar, or SHARAD, instrument aboard MRO revealed subsurface geology allowing scientists to reconstruct the formation of a large chasm and a series of spiral troughs on the northern ice cap of Mars. "*SHARAD is giving us a beautifully detailed view of ice deposits, whether at the poles or buried in mid-latitudes, as they changed on Mars over the last few million years*," said Rich Zurek, MRO project scientist. On Earth, large ice sheets are shaped mainly by ice flow. According to this latest research, other forces have shaped, and continue to shape, polar ice caps on Mars. The northern ice cap is a stack of ice and dust layers up to two miles deep, covering an area slightly larger than Texas. Analyzing radar data on a computer, scientists can peel back the layers like an onion to reveal how the ice cap evolved over time.

One of the most distinctive features of the northern ice cap is Chasma Boreale, a canyon about as long as Earth's Grand Canyon but deeper and wider. Some scientists believe Chasma Boreale was created when volcanic heat melted the bottom of the ice sheet and triggered a

catastrophic flood. Others suggest strong polar winds carved the canyon out of a dome of ice.

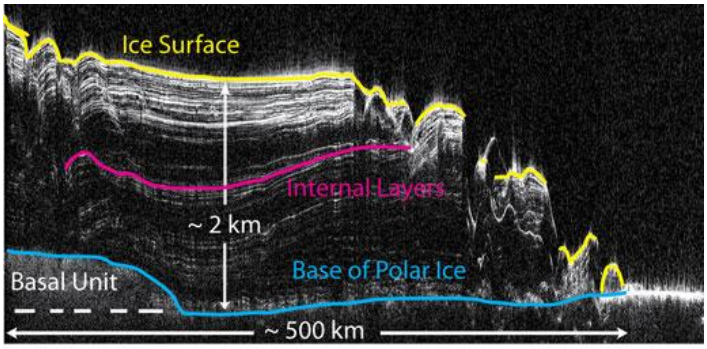


This image, combining data from two instruments aboard Mars Global Surveyor, depicts an orbital view of the north polar region of Mars. The ice-rich polar cap (the quasi-circular white area at center) is approximately 1,000 kilometers (621 miles) across. The white cap is riven with dark, spiral-shaped bands. These are deep troughs that are in shadow. They do not reflect sunlight as well or have more internal layers exposed. To the right of center, a large canyon, Chasma Boreale, almost bisects the ice cap. Chasma Boreale is about the length of the United States' famous Grand Canyon and up to 2 kilometers (1.2 miles) deep. New findings from the shallow radar instrument aboard the Mars Reconnaissance Orbiter have revealed subsurface geology in this region, allowing scientists to reconstruct the formation process of the large chasm and spiral troughs. The image synthesizes topographic data from Mars orbiter laser altimeter and images from the Mars orbiter camera. MGS operated longer at Mars than any other spacecraft in history; It went silent in November 2006, after gathering data at Mars for more than four times as long as originally planned. Image Credit: NASA/JPL-Caltech/MSSS

Other enigmatic features of the ice cap are troughs that spiral outward from the center like a gigantic pinwheel. Since the troughs were discovered in 1972, scientists have proposed several hypotheses about how they formed. Perhaps as Mars spins, ice closer to the poles moves slower than ice farther away, causing the semi-fluid ice to crack. Perhaps, as one mathematical model suggests, increased solar heating in certain areas and lateral heat conduction could cause the troughs to assemble.

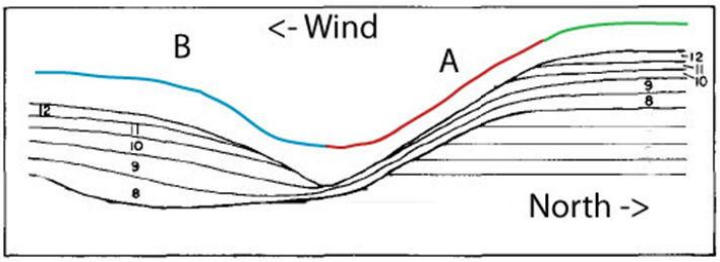
Data from Mars now points to both the canyon and spiral troughs being created and shaped primarily by wind. Rather than being cut into existing ice very recently, the features formed over millions of years as the ice sheet grew. By influencing wind patterns, the shape of underlying, older ice controlled where and how the features grew. "*Nobody realized that there would be such complex structures in the layers*," said Jack Holt, the lead author of the paper focusing on Chasma Boreale. "*The layers record a history of ice accumulation, erosion and wind transport. From that, we can recover a history of climate that's much more detailed than anybody expected*."

MRO was launched in August 2005. SHARAD and the spacecraft's five other instruments began science operations in November 2006. Almost 40 years ago, Mariner 9 spacecraft relayed to Earth the first video images of Mars' northern polar ice cap, revealing a strange pattern of spiral swirls that has puzzled scientists ever since.



This image shows a cross-section of a portion of the north polar ice cap of Mars, derived from data acquired by the Mars Reconnaissance Orbiter's Shallow Radar (SHARAD), one of six instruments on the spacecraft. The data depict the region's internal ice structure, with annotations describing different layers. The ice depicted in this graphic is approximately 2 kilometers (1.2 miles) thick and 250 kilometers (155 miles) across. White lines show reflection of the radar signal back to the spacecraft. Each line represents a place where a layer sits on top of another. Scientists study how thick the pancake-like layers are, where they bulge and how they tilt up or down to understand what the surface of the ice sheet was like in the past as each new layer was deposited. Image Credit: NASA/JPL-Caltech/ASI/UT

"*These anomalous features have gone unexplained for 40 years because we have not been able to see what lies beneath the surface*," said Roberto Seu, SHARAD team leader. "*It is gratifying to me that with this new instrument we can finally explain them*." Using new data from the Mars Reconnaissance Orbiter (MRO), researchers have finally uncovered the secrets of the troughs that snake through the ice cap like a spiraled maze. Apparently, the wind did it.



"*Radar cross sections reveal layers of ice deposited throughout the ice cap's history*," says Holt. "*The size and shape of those layers indicate that wind has played a key role in creating and shaping the spiral troughs*." Not only does wind shape the spirals, but also it causes them to move. They rotate around the north pole, turning like an excruciatingly slow pinwheel, curiously enough, against the wind. Smith explains the process: "*Cold air from the top of the ice cap sweeps down the slope, gaining speed and picking up water vapor and ice particles along the way. As this wind blows across the trough and starts up the other slope (the cooler side, facing away from the sun), it slows and precipitates the ice it holds. All of this ice is deposited on this cool slope, building it up, so the trough actually grows and migrates, over time, against the wind*." Alan Howard first suggested the ice trough migration model based on Viking spacecraft data back in 1982. His theory, that wind erosion and sunlight shape and move the troughs, was never widely accepted, but the new data supports it. The Coriolis force generated by Mars' rotation twists the winds sweeping down from the ice cap. "*That explains the troughs' spiral design*," says Smith.

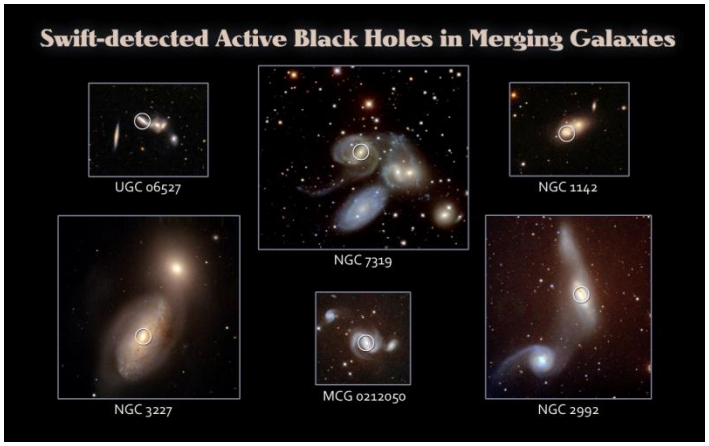
Similar formations can be found in Antarctic regions of Earth, but without the spiral shape. Icy megadunes in Antarctica do not spiral like the ice troughs of Mars. "*You don't see spirals in Earth's Antarctic ice sheet because local topography there prevents the winds from being steered by the Coriolis force*." The radar data have solved another icy

mystery, too--the origin of Chasma Boreale. Chasma Boreale is a Grand Canyon-sized chasm that slashes through the midst of the spiraled troughs. Theories to date suggested that either wind erosion or a single melt event excavated Chasma Boreale within the past 5 to 10 million years. "*Not so*," says Holt. "*The MRO data clearly show the chasm formed [long before the spirals did] in a much older ice sheet dating back billions of years. Due to the shape of that ancient sheet, the chasm grew deeper as newer ice deposits built up around it. Winds sweeping across the ice cap likely prevented new ice from building up inside the chasm [so it never filled up*]." The radar data also revealed a second chasm matching Boreale in size.

Chasma Boreale is shown in a modern image of the Martian north pole, above. "*This chasm's never been seen before -- unlike Boreale, it did fill up with ice, probably because it's in a different location. Boreale is closer to the highest points of the ancient ice cap, where the winds are stronger and more consistent*." By discovering that both Chasma Boreale and the ice troughs were shaped by similar processes over different timescales, Holt and Smith answer some questions about Martian climate history. But they're also sparking new ones. "*For a long stretch of Martian history the ice layers were regular and uniform, then there was a distinct period when the spiral ice troughs got started*," says Smith. "*Something changed. There must have been a very fast (relatively speaking) and powerful change in climate. We still don't know what that change was*." "*To figure that out, we need to look at the rest of Mars for evidence of other changes at that same time," says Holt. "This is just the tip of the ice berg*." http://www.nasa.gov/mro

SWIFT FINDS 'SMOKING GUN' OF BLACK HOLE ACTIVATION

Data from an ongoing survey by the Swift satellite have helped astronomers solve a decades-long mystery about why a small percentage of black holes emit vast amounts of energy. Only about one percent of supermassive black holes exhibit this behavior. The new findings confirm that black holes "light up" when galaxies collide, and the data may offer insight into the future behavior of the black hole in our own Milky Way galaxy.



The optical counterparts of many active galactic nuclei (circled) detected by the Swift BAT Hard X-ray Survey clearly show galaxies in the process of merging. These images, taken with the 2.1-meter telescope at Kitt Peak National Observatory in Arizona, show galaxy shapes that are either physically intertwined or distorted by the gravity of nearby neighbors. These AGN were known prior to the Swift survey, but Swift has found dozens of new ones in more distant galaxies. Credit: NASA/Swift/NOAO/Michael Koss and Richard Mushotzky (Univ. of Maryland)

The intense emission from galaxy centers, or nuclei, arises near a supermassive black hole containing between a million and a billion times the sun's mass. Giving off as much as 10 billion times the sun's energy, some of these active galactic nuclei (AGN) are the most luminous objects in the universe. They include quasars and blazars. "*Theorists have shown that the violence in galaxy mergers can feed a galaxy's central black hole*," said Michael Koss, the study's lead author. "*The study elegantly explains how the black holes switched on*." Until Swift's hard X-ray survey, astronomers never could be sure they had counted the majority of the AGN. Thick clouds of dust and gas surround the black hole in an active galaxy, which can block ultraviolet, optical and low-energy, or soft X-ray, light. Infrared radiation from warm dust near the black hole can pass through the material, but it can be confused with emissions from the galaxy's star-forming regions. Hard X-rays can help scientists directly detect the energetic black hole. Since 2004, the Burst Alert Telescope (BAT) aboard Swift has been mapping the sky using hard X-rays. "*Building up its exposure year after year, the Swift BAT Hard X-ray Survey is the largest, most sensitive and complete census of the sky at these energies*," said Neil Gehrels, Swift's principal investigator. The survey, which is sensitive to AGN as far as 650 million light-years away, uncovered dozens of previously unrecognized systems. "*The Swift BAT survey is giving us a very different picture of AGN*," Koss said. The team finds that about a quarter of the BAT galaxies are in mergers or close pairs. "*Perhaps 60 percent of these galaxies will completely merge in the next billion years. We think we have the 'smoking gun' for merger-triggered AGN that theorists have predicted*." http://www.nasa.gov/swift

BRIGHT COMET C/2009 R1 MCNAUGHT VISIBLE IN AM SKY

This comet, which brightened significantly through May and into mid-June, and is now at is best for northern-hemisphere observers. It is near its closest to Earth, and will pass perihelion on July 2. It will now rapidly sink into the twilight and move southward and be lost to northern observers. It has reached magnitude as bright as +5.5 or so, with some tail visible in binoculars from dark skies. So it is considerably brighter than the majority of comets and borderline naked-eye visible.

Here is an excellent image recently taken of the comet:

http://www.spaceweather.com/submissions/pics/m/Michael-JAcger-2009R120100610LRGBweb_1276181871.jpg

If the weather clears, get out and take a look at it before it is gone…

Sky&Telescope web article on the comet:

http://www.skyandtelescope.com/observing/highlights/94277259.html

FROM THE EDITOR'S TERMINAL

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

If you wish to contribute an article or suggestions to ***The Stargazer*** please contact Mark Folkerts by email or by telephone (425) 486-9733.

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

In June's StarGazer:

The next EAS Meeting is 3:00 pm, Saturday July 17th, at the Evergreen Branch Library.