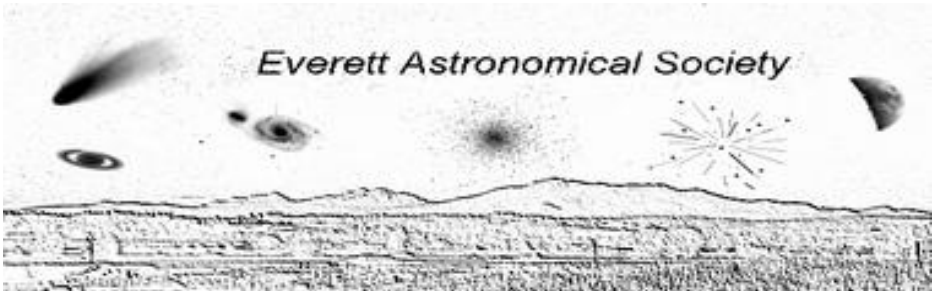
Volume MMX No. 4



The Stargazer

April 2010

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

EAS BUSINESS…

EAS MEETING - - SATURDAY APRIL 10TH - 3:00 PM, EVERETT EVERGREEN BRANCH LIBRARY

This month's speaker will be EAS member John Goerger, who will discuss a range of astronomy and science-fiction books of interest to astronomers, and recommendations of "Books for Rainy Night Reading".

Attending members will be eligible for a monthly door prize.

★ STAR PARTY INFO ★

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

Tentative dates for Star Parties for 2010.
Note the change to Friday nights.

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

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

Please also join the EAS e-mail list, **and then send mail to the mail list** at ***everett_astronomy@topica.com*** to coordinate spur-of-the-moment observing get-togethers, on nights when the sky clears. We try to hold informal close-in star parties each month during the spring, summer, and fall months on a weekend near the New moon at a member's property or a local park.

Other Western US Star Parties This Season

APRIL -

Apr 8-11 Southern New Mexico Star Party - City of Rocks State Park - Silver City, NM, http://www.astro-npo.org/

Apr 16-18 - RCA Maupin Dark Sky Star Party, Maupin, OR - http://www.rca-omsi.org/sp/maupin.htm

Apr 16 & 17, and Apr 23 & 24 – EAS Astronomy Day Star Parties

MAY -

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

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

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

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

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

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

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

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

JUNE -

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

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

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

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

Jun 9-13 - The Rocky Mountain Star Stare (RMSS), Pike Nat Forest, Colorado Springs, CO http://www.rmss.org/

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

Jun 19 Bogus Basin Star Party Bogus Basin

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

JULY -

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

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

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

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

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

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

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

AUGUST -

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

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

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

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

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

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

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

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

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

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

SEPTEMBER -

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

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

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

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

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

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

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

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

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

OCTOBER -

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

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

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

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

NOVEMBER -

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

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

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

2010 ASTRO CALENDAR

April 2010

Apr 04 - Easter Sunday
Apr 08 - Mercury at Its Greatest Eastern (evening) Elongation (19 Degrees)
Apr 19-25 - Astronomy Week
Apr 10 – EAS Meeting – Saturday 3:00 pm Evergreen Branch Library
Apr 10 - OMSI Astro Photometry, Spectroscopy & Astrometry Workshop - Portland, OR
Apr 22 - Lyrids Meteor Shower Peak
Apr 16-17, 23-24 – EAS Astronomy Day Star Parties – Harborview Park
Apr 24 – EAS Astronomy Day – Both Library Locations – 9 am to 6 pm

May 2010

May 02 - Asteroid 2 Pallas Occults TYC 2026-01347-1 (11.9 Mag Star)
May 05 - Eta Aquarids Meteor Shower Peak
May 07 - Space Day
May 08 – EAS Meeting – Saturday 3:00 pm Evergreen Branch Library
May 16 - Moon Occults Venus
May 26 - Mercury at Its Greatest Western (morning) Elongation (25 Degrees)

June 2010

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

July 2010

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

August 2010

Aug 01 - Alpha Capricornids Meteor Shower Peak
Aug 05 - Neil Armstrong's 80th Birthday (1930)
Aug 06 - Southern Iota Aquarids Meteor Shower Peak
Aug 07 - Mercury At Its Greatest Eastern (evening) Elongation (27 Deg)
Aug 09 - New Moon
Aug tba – EAS Meeting – location tba
Aug 12 - Perseids Meteor Shower Peak
Aug 20 - Venus at Its Greatest Eastern (evening) Elongation (46 Deg)
Aug 20 - Neptune at Opposition
Aug 25 - Northern Iota Aquarids Meteor Shower Peak

September 2010

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

October 2010

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

November 2010

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

December 2010

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

OBSERVER'S INFORMATION…

LUNAR FACTS

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

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

Object	*Rises*	*Sets*	*Con*	*Diam.*	*Mag*
Sun	***06:30 am***	***19:52***	***Psc***	***30'***	***-27.5***
Mercury	**6:56 am**	**21:44**	**Ari**	**8"**	**+0.4**
Venus	**7:51 am**	**20:48**	**Ari**	**10"**	**-3.9**
Mars	**12:41**	**04:14 am**	**Can**	**8"**	**+0.4**
Jupiter	**05:36 am**	**16:57**	**Aqr**	**34"**	**-2.1**
Saturn	**17:42**	**06:12 am**	**Vir**	**19"**	**+0.6**
Uranus	**05:51 am**	**17:43**	**Psc**	**03"**	**+5.9**
Neptune	**04:49 am**	**15:02**	**Aqr**	**02"**	**+7.9**
Pluto	**01:39 am**	**10:56 am**	**Sag**	*	**+14.0**

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

UW Astronomy Speakers Colloquium Schedule

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

'IT'S OVER YOUR HEAD' – ASTRONOMY PODCASTS

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

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

EAS MEMBER NEWS

$$ - FINANCIAL HEALTH - $$

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

CLUB SCOPES

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

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

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

OFFICES STILL VACANT FOR 2010 -

President: Schedule & run the club monthly meetings.

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

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

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

Outreach chairperson: Coordinate requests from public for EAS member volunteers to conduct star parties or presentations at visits to schools, senior centers, scout meetings, etc. We often have requests for members of the EAS to come and help with an 'astronomy night' event from local schools, scout groups, senior homes, or similar groups. Usually this would be in the form of a star party at their gathering, or perhaps a short slide show or night sky talk. Providing education and support to the community about interest astronomy is one of the main missions of the EAS. A star party night can be a rewarding event for all involved. **Please email Mark Folkerts with your interest (or suggestions).**

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

Other volunteers? Find a way to help and contribute. Come up with a new idea to promote the EAS and astronomy in your community.

EAS Membership Benefits & Information

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

Magazine Discounts –

In addition you will be able subscribe to ***Sky and Telescope*** for $7 off the normal subscription rate, contact the treasurer (Carol Gore) for more information. http://everettastro.org/application.htm (**When renewing your subscription to *Sky & Telescope* you should send your S&T renewal form along with a check made out to Everett Astronomical Society to the EAS address.** The EAS treasurer Carol Gore will renew your *Sky and Telescope* subscription for you. **Astronomy** magazine offers a similar opportunity to club members.)

Membership in the Astronomical League -

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

EAS Club Telescope Borrowing -

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

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

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

EAS Library -

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

Joining or Renewing with the EAS -

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

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

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

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

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

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

- Clear Skies, Jim Bielaga"

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

Digital Lunar Orbiter Photographic Atlas of the Moon

The Lunar and Planetary Institute has created a digital version of the Lunar Orbiter Photographic Atlas of the Moon, and Consolidated Lunar Atlas available online at:
http://www.lpi.usra.edu/research/cla/menu.html
http://www.lpi.usra.edu/research/lunar_orbiter

Observing Jupiter's Moons – Java tool

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

Transit times for Jupiter's Great Red Spot in 2008

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

NOAA Sun Calculator

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

International Space Station – Visible Seattle Passes

ISS Visibility – Heavens Above:
http://www.heavens-above.com/PassSummary.asp?lat=47.979&lng=-122.201&alt=0&loc=Everett&TZ=PST&satid=25544

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

In EAS StarGazer - "The Planetarium"

(for *APRIL 10TH-MAY 22ND*)

- By John W Goerger - pos1@earthlink.net

Our Celestial Friends are there in the Spring 2010 evening sky *(assuming [for those of us living in the Pacific Northwestern part of North America] that you can see the night sky without those pesky overcast raincloud getting between you and our lovely universe*), our

moon, the planets of our solar neighborhood, the stars, globular star clusters, star clouds and galaxies.

Even our Sun can be examined and studied in the daytime sky; that is, if you are using the correct and proper equipment such as a solar filter (sunspots) fitted over the front of your 'scope, or a PST which allows the observer to check out solar prominences and related activity of the sun (flares, but remember a *FLARE* is not a *PROMINENCE* as a flare may show for only a few minutes while a prominence can be seen for a few hrs or so). Given the spectacular prominence that was observed by some members of the EAS and the astronomy community at large, last month, it really was an "eye-opener" for those that saw it. If you haven't heard about it or saw it in late March of 2010, go to one of the many solar sites on the web and view this really cool jet of material on the rim of the sun, looping and curling into itself and then back into our star. The earth, if placed near it would have appeared as a pencil dot, inside of this ribbon of solar material being bent and twisted by one of the many magnetic field lines generated by the sun.

Sometimes, sunspots can create *FLARES*, as stated in the previous paragraph which in turn can produce CMEs (*CORNONAL MASS EJECTIONS*) and at times, some do come our way. Generally the solar wind which can become somewhat active will send a charge in the direction of our planet and in about 2 to 3 days later, both the North and South Poles receive this electrical charge creating what we in the northern hemisphere of the earth call the "NORTHERN LIGHTS" and for those who live in the southern hemisphere, they call it the "SOUTHERN LIGHTS". However, when a SOLAR STORM created by those Flares produce a CME they really produce those Northern and Southern Lights, not within 2-3 days but rather within **8-9 minutes** after the flare has erupted! Of course to us amateur astronomers world-wide, looking up into the sky for an evening of observation and by chance seeing these "lights" many of us would be saying; "oh's" and "ah's" at the northern and southern lights dancing and shimmering in the nighttime sky.

Of course, while we amateur astronomers are giggling, smiling and patting each other's back and remarking; "what a beautiful, magnificent and glorious sight", the operators of space-based satellites are scrambling to orient those spacecraft so they will not have their sensitive electronics from being fried by the high-speed particles that are part of the CME and its plasma. Nor do we think about the hundreds of thousands of dollars being loss because airline companies would have to divert jetliners from certain polar routes that would carry the jetliner and its passengers into possible increased radiation levels as well as the potential of affecting the electronic equipment of the jet. Additionally, there is also the BIG PROBLEM of overloading transformers, which carry electric current across earths' landmasses to our cities and the great potential for massive blackouts, because of the huge amount of energy that is transferred into earths' magnetic field because of these solar storms. Nope, we star-gazers just like to see a pretty night time show being presented to us by mother-nature, free to us; and if a black-out happens, well more-the-merrier! This means the sky would get really, really, really, dark and then we can train our telescopes for those hard-to-find fainter deep-sky objects!

The previous comments are of course not true to the great majority of amateur astronomers (but there are a few among us). We are all concerned about the devastating effects such a solar storm could do to our civilization. It wasn't that many years ago when the idea of monitoring, what is now called "Space Weather" was kind of a joke; but it isn't anymore---24 hours-a-day-365-days-a-year solar scientists are studying the sun with a fleet of many solar-based satellites and ground-based observatories to understand and give a WARNING if trouble is heading our way and to take the necessary steps to protect our technological electronic-based instruments, software and hardware from such a destructive force of nature. Just a few years ago there was blackout in parts of Canada and the Midwestern United States which had as it Primary Cause; a CME from the Sun. Also, there have been satellites, in earth orbit which were damaged by these solar storms as well. However, at present we have been lucky, but as everyone knows; luck will run out someday, so it is the smart person who works to put the "odds in one's favor"---ours, the human race. We do that by investing in the technology, and personal to understand our sun, and being able to predict when it will create these CMEs, and the abilities to ride out those storms when they do hit!

I**n August of 1972** a solar storm struck our region of space and that previous April the APOLLO 16 crew had returned from the moon with the last of the manned missions to the moon APOLLO 17, preparing for a lunar landing in December of that year. If an Apollo crew had been on the moon's surface, in August when the solar storm struck, it is estimated they could have absorbed 400 Rems, but might not have been deadly to them; assuming they could have had a quick trip back to earth for medical care; this according to Francis Cucinotta, NASA's Radiation Health Officer at the Johnson Space Center. A **REM (1)** stands for ***ROENTGEN-EQUIVALENT-MAN*** is a dose of radiation which causes the same injury to human tissue as one (1) roentgen of x-rays. For example, a routine CAT scan, the kind for checking for tumors delivers about 1 rem. Generally if a group of people were to receive a dose of 300 rems all at once, there is good chance that at least 50% of them would die within 60 days, assuming they did not receive any medical care.

January 20th 2005 a sunspot called ***NOAA 720*** erupted which sparked what is called an ***X-CLASS SOLAR FLARE*** (nastier than solar prominences) and sending a billion-ton cloud of electrified gas (those-good old Coronal Mass Ejection) near the speed of light and within minutes reaching the earth-moon location. This then began a days-long "*PROTON STORM*". There appeared to be a warning that such event was going to happen as January 2005 was a fairly active month of sun activity, when a very large sunspot appeared and started erupting. There were 720 sunspots formed from the 15th to the 19th of that month and four solar flares. It was the 5th one of January 20th which observers of such events were expecting that exploded! Since the moon has NO MAGNETIC FIELD or an atmosphere there is nothing to stop the onslaught of Protons hitting the moon or if anyone in a spacesuit had been walking on the lunar surface then.

If a space explorer/miner had been there, at that time, they probably would not have been able to get to a shelter in time and would have become sick; at first they might feel fine than radiation sickness would set-in: upset stomach, fatigue and a low blood count, many of these symptoms lasting for days and requiring immediate medical treatment! The January 20 2005 proton storm was estimated to pack more than 100 million electron volts (100MeV) of energy! Accordingly, these protons could burrow through 11 centimeters of water and a relatively "thin" spacesuit would offer little protection. The astronauts on duty in the ISS however were protected for the following reasons and the main one is that the ISS orbits inside the Earth's magnetic field and the other is the station itself is heavily shielded, according to Cucinotta; "the crew probably absorbed no more than 1 rem", at that time.

With the storm of 1972 had the astronauts been in orbit at the time but inside the Apollo Command Module its aluminum hull would have dropped the amount of rems the astronauts might have absorbed from

400 rems to less than 35 rems, again according to Francis Cucinotta. Additionally, "NASA measures the shielding of their ships in units of areal density-grams per centimeter-squared"-Cucinotta. An Apollo Command Module hull was rated at 7 to 8 g/cm2 with the Space Shuttles have 10 to 11 g/cm2. The ISS hull at its most heavily shielded area is 15 g/cm2. If we can convince or if not, overturn the silly and stupid cancellation of the United State returning manned expeditions and human settlements on the moon by the present Obama Administration, those bases would have shelters which could exceed 20 g/cm2. Note however, a typical spacesuit has only 0.25 g/cm2; "that's why you want to be indoors when the proton storm(s) hit", said Cucinotta.

The easiest way to avoid problems (radiation) for those that someday will call the moon, their "home" is the simple fact of burying the settlement just a few feet under the lunar soil. Also, if a person thinks about it, there have to be caves, tunnels (lava tubes) inside the moon and probably also inside the planet Mars! With caves, tunnels and other types of natural formations under both the Moon and Mars surface, it could solve quite a few problems of creating large areas for human beings to live in. If the structure(s) were found to be "sound" perhaps a type of sealant could be applied to the inside of the formation and pressurized. This way a much larger space would be provided to the settlers, a "shirt-sleeve" environment without the need of staying confined inside a building all the time.

★★★

Concerning the planet Mars; I have a really big bone to pick (*problems*) with many who have been claiming that someday we will be able to ***TERRAFORM*** the planet Mars. These claims have been going on since at least the late 1970's where there was even the suggestion from some, that the moon could be terraformed so that a breathable atmosphere and lake(s) could be created on the moon and of course Mars! For the moon to hold onto an atmosphere where we could breathe the air and not have to wear spacesuits and have a lake or even an ocean on the moon, its mass would have to be increased by such an amount that don't you think that might cause the earth and its inhabitants some MAJOR PROBLEMS? I am not just writing about the increase in gravitational attraction between the Earth and Moon but the ***TIDAL EFFECTS***! Remember even though the effect of gravity is based on the "Square of the Distance" between the two bodies there is also, a tidal effect, which is based on the "Cube of the Distance" between the two bodies! Yes, I know there is the "Gravitational Constant" and one has to take into account the Mass of one Object and the Mass of the other body but for the average "amateur astronomer" and the person who is not a "Physics Major" let us just keep it simple---the basics. Remember even though the effect of gravity is based on the "Square of the Distance" between the two bodies but with tidal effects, it is the "Cube of the Distance" between the two bodies!

The "Square of the Distance" means that if the mass (increases) and/or the distance (decreases) the force of attraction goes up by that distance or mass, multiplied by itself, ***TWICE***! Light also follows this notion. As an example; say you are holding a flashlight 10 feet from you and then you move five (5) feet closer to the flashlight, the brightness of the flashlight has not increased by 5X but 5x5 or 25X BRIGHTER! Same for Gravity but with Tidal Effects it would be 5x5x5 or 125 x GREATER for a tidal force! Imagine if someday the moon was so massive that it could have an atmosphere such as we have here on Earth capable of sustaining an ocean on its surface, what kind of TIDES would we be experiencing here on the Earth? Yep, I think you are right, not very pleasant ones! In the NEXT GENERATION STAR TREK movie where the ENTERPRISE and her gallant crew chase the evil BORG (sounds Swedish [you have to know the film or be a real TREKKIE to get that joke]) back into Earth's past where the first Warp Drive ship is going to be launched from an old ICBM based in Montana (that is kind of scary---what are Montanans doing with a "warp-drive engine) and the BORG are trying to stop its First Flight. Anyway later in the movie Will Ryker is telling the creator of the Warp-Drive that; "you can see Lake Armstrong on the Moon". So, as you can see this non-science has been creeping into the world of make-believe (humm…, maybe that is where it should be).

Anyway in one of the last TV episodes' of ENTERPRISE the crew is battling a crazy earth-human on Mars who is trying to activate a weapon system and turn the city of San Francisco into a big pile of goo and while on Mars they mention the atmosphere generators which someday will create an atmosphere on Mars dense enough for humans to live there just like the Earth! Here again is the Terraforming idea showing up, but even though STAR TREK is science fiction (there is "good" and "bad" science fiction; the *STAR TREK* of the 1960s was GOOD and *LOST IN SPACE* (was) is an example of *REALLY BAD* science fiction-'nuff said on that subject). This subject of Terraforming Mars is a serious subject in the field of planetary science and usually it is mentioned in some astronomy textbooks, magazines and films about our solar system and a favorite topic of some scientists at JPL (Jet Propulsion Laboratory), located in the city of Pasadena CA. Here is a *MAJOR BREAKING POINT* to the idea---***Mars has no Magnetic Field***---it is rotating at a velocity that if the core was molten as the earth, Mars would have a magnetic field as the earth does.

Without the magnetic field even if a proto-atmosphere could be started somehow, the Sun's Solar Wind would come along and with the CMEs, rip any beginning Martian atmosphere to shreds! Also, Mars is not massive enough to hold onto an atmosphere and to do it; the mass of Mars would really have to be increased, but BIG! Yes, in its ancient past Mars had an atmosphere but lost it for a variety of reasons, not the least is the possibility that an ancient impact with a giant comet or asteroid could have blown a large portion of Mars' atmosphere into space but also the inside of the planet was "drying up"---from a geological perspective! So, given this and the fact the planets' mass is not massive enough to "hold onto its atmosphere" and the core was solidifying, so less gasses were being produced by Mars, eventually Mars would end up the way we see it today. It is one thing to speculate about the "what if" for Mars, but to actually be spending hard-to-get funds with the idea that Terraforming Mars is a "practical approach" for manned space operations is at best very unprofessional for some scientists to actually think it is a "reasonable achievement" for humankind's movement into the cosmos. Two more points; First, even if somehow the "*MAGNEITC FIELD* " problem could be made to "disappear" where would the material come from to increase the Mass of Mars so it could hold onto a breathable atmosphere for humans and, Secondly, by creating an atmosphere on Mars that would create rain which in turn forms streams, rivers, lakes and oceans. Now areas of Mars that had been accessible for study and research would be buried under hundreds if not thousands of tons of water!

I want Humanity to inherit the solar system and hopefully they will, in the future, setting their sights on the nearby stars! We are always exploring but we need to also utilize what we are learning about the cosmos and use the material that is contained in our star-system. The asteroids, the material on the lunar surface, comets and the energy from our star is all there for us, all is needed is for us to made the decision to go there, and do it! The technological base has been established but it us up to us to demand of our political leaders to lead the charge for us to become a space-faring civilization; not a planet-

bound one. For staying on one's home-world will lead to extinction----99% of all living creatures that have ever existed on Earth, no longer exist, we have a choice, we can take space and make it into something wondrous, we can create what I call the ***HUMANIZATION OF SPACE****!*

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Space Shuttle DISCOVERY (STS-131) left the launch pad on Monday April 5 2010 for the International Space Station 45 minutes before sunrise, at 6:21 AM EDT, lighting up the predawn sky and as the winged spacecraft ascended into morning sky, its plume swirled as if lifting the space vehicle on Gossamer Wings. Her crew is the following: Commander Alan Poindexter with Pilot Jim Dutton, Mission Specialists are Clay Anderson, Rick Mastracchio, Dottie Metcalf-Lindenburger, Stephanie Wilson and Japan Aerospace Exploration Agency astronaut Naoko Yamazaki. Dutton, Linenburger and Yamazaki are making their first spaceflights and are the last rookies to fly aboard a space shuttle before the space shuttle fleet is retired.

The mission is planned for a 13-day flight to the ISS delivering science experiments, and related supplies to Humanity's' permanently human-occupied space-based orbital outpost. There are 3-planned spacewalks from changing out a gyroscope on the station's truss (backbone), install a spare ammonia storage tank, and retrieve the Japanese experiment from the station's interior. Within the cargo bay of the space shuttle is the multi-purpose logistics module LEONARDO. Basically, it is a "moving van" which will be attached, temporarily to the ISS and returned to the shuttle's cargo bay by the 15th of April (TAX DAY FOR ALL US CITIZENS! Sick Mind). The Leonardo has supplies, new crew sleeping quarters and science racks which will be taken to the station's laboratories. This according to NASA is the "*final compliment of laboratory facilities that will complete the station's overall research capabilities*".

Additionally NASA is reporting that Lindenburger "will be the last of three teachers selected as mission specialists in the 2004 Educator-Astronaut class to fly on a space shuttle". On the STS-131 mission, the educational activities will deal with robotics and promoting careers in science, technology, engineering and math. The following website is for NASA's teacher and student resources and activities related to robotics: http://www.nasa.gov/education/robotics The planned landing of Shuttle Discovery is for 8:30 AM (EDT), Sunday April 18 and this will be Discovery's 38th flight and the 33rd shuttle mission dedicated to Space Station assembly and maintenance. It should be noted that all of NASA's Space Shuttles are rated for at least 100 flight missions. When I was employed as a student assistant to Dr Thomas Stephen Eastmond and Tessmann Planetarium, located on the campus of Santa Ana College in the late 1970s and into the '80s, ROCKWELL INTERNATIONAL (had purchased North American Aviation a few years back) informed us that each Space Shuttle had a life duration of 700+ missions; assuming the proper maintenance and funding for the vehicles.

★★★

NASA has signed a **$335 MILLION** modification to the current ISS contract with the Russians. If you are somewhat upset that the only way NASA and the United States of America will get their astronauts to the Space Station is by getting a hitch from the Russians, then this might cause you to "blow your lid". This "*modification*" which is adding flights onboard the Soyuz into 2014 will be paying the Russian Federal Space Agency an overall increase in the total amount NASA will be paying for a seat in their Soyuz. Previously, NASA had a contract that dealt with crew transportation, rescue and related services until 2013. Basically, the new extension **raises the seat cost to $55.8 million** from the *present one of $26.3 million per seat/per astronaut* and **$521 million per seat for flights in 2011 and 2012**! Oh Yeah, the Obama Administration really did a great deal for NASA and the United States of America; we are going to shut down the only vehicle the United States can launch to carry astronauts to the International Space Station, of which the United States has spent most of the cost in the building and construction of the Station. Then we are no longer going to the moon, since he cancelled the NASA's plan for American Manned Missions to the moon but, instead spend lots of money to engineers to just sit around drawing pretty pictures of POSSIBLE manned spacecraft---in the field of aviation this is known as creating a "paper airplane" or in this case, paper spaceships.

A bit of aviation history now; when Juan Tripp who owed Pan American Airlines (PAN AM) told the Boeing Company and Douglass he wanted a Jetliner for his airline company, Boeing was already to go into production as it had already flown the test aircraft we all know and love, the DASH 80! Guess what Douglass had? Yep, a "Paper Jetliner", no test vehicle, no nothing. Once the starter gun was fired by Juan Tripp that he wanted jetliners Boeing took the lead and Douglass was never able to catch up and as we all know guess who became a part of the Boeing Company? Well, I suspect the same thing just might happen to NASA and us as a Nation. We could get "bought out" or maybe even worst, prevented to "get into the game" and instead of being treated and respected as a "PARTNER", NASA and the USA would be regulated to the level of a "supplier". This could very easily happen, not because we do not have the technology and workmanship; WE DO; we just do not have a PRESIDENTIAL ADMINISTRATION OR CONGRESS willing to give NASA and the American People the *FUNDING and MORAL SUPPORT* to remain a Leader, into the Cosmos!

★★★

So, to relive some stress take a look toward the west at sundown, (*please, please, can someone do something about those irritating overcast clouds and rainmakers that seem to be everywhere, here in the Puget Sound area?)* and first, locate that stunning "UFO-LIKE-OBJECT" and the Queen of Evening Sky – ***VENUS;*** the planet of Beauty and Love - yeah right! Are you aware (well, if you are an amateur astronomer, you *SHOULD* know this), that planet is a *HELLHOLE*! It sure isn't any planet of "beauty", with an atmosphere of around 50% Carbon Dioxide and 50% Sulfuric Acid, and an atmospheric pressure the equal to being on the bottom of the Mariana's Trench here on Earth with pressures hundreds of square inches. Added to that, because of its atmosphere which acts like a giant greenhouse, the "surface" temperature is close to 900 degrees, day and night!

Anyway, by the 15th Venus glows at a -3.9, brighter than any star-like object in the sky, except for the sun and the moon. If you see something that indeed looks like one of Boeing's biggest twin-aisle airliners coming from the west, it probably is Venus you are seeing and not one of the landing lights on a Boeing Jetliner! If you have the chance to aim a telescope at Venus, use your lowest power eyepiece because for one, you are doubling the amount of atmosphere you are having to peer though, verses to pointing the 'scope overhead where the density of the air is half. Venus is about 90% lit and takes up about 10.9 arc seconds in the sky! Dropping to the right of Venus is ***MERCURY*** as it is descending toward the horizon. It twinkles at a 1.2 by the 14th, so as soon as you can go out and try to find it before it gets to low in the western horizon. The separation between the two of them grows and on this date they are about 6 degrees from each other (or 12 "Full Moon Diameters"). According the following evening, Mercury is less than 2 degrees below a 1.5-day-old-moon where it is about 7 degrees above the western-northwestern horizon and also 7 degrees

from Venus, 45 minutes after sunset. Interesting, on the 16th, the moon is 7 degrees higher than Venus but just 3 degrees below the Pleiades star cluster (M45), a good sight and maybe you might photograph it, assuming there aren't any problem-clouds covering everything!

Wait about an hour after sunset on the 24th and 25th of April because the Pleiades will be 3.5 degrees upper right of ***VENUS***, using binoculars for this one should help a great deal. Venus in early MAY is now about 20 degrees above the horizon still glittering at a -3.9 against the twilight of the western sky, 45 minutes after sundown and will not set until around 10 PM local Daylight Time (LDT). By, the 15th its 12 arc seconds in the sky and about 85% of her Is being lit; may not seem like much but if you were able to see her in early April and now though a telescope you will notice a difference even though reading about it may not seem like much. Venus will be near some bright type stars in the first part of May so keep checking on her from time to time. On the 21st, M35 will be less than 1 degree southwest of Venus. Use either binoculars or a telescope, this not one you would want to miss!

MARS is at magnitude 0.4, and by the 15th of April to the 18th, it is about 1 degree north of the Beehive Cluster (M44); use an optical aid for this viewing of both these celestial treasures within the same field of view if you can---awesome! Its location is in the south and somewhat high in the sky so this would be your best time to put some telescope time on it! The 21st the moon pays Mars a visit being about 5 degrees below Mars than. At the end of April Mars has dimmed to a 0.7 but will still outshine the star Regulus by at least ½ of a magnitude; is that true? Go out and look for yourself on that night and report what you estimated the brightness difference between the two objects at the next EAS meeting, this coming April 10th. The size of Mars has shrunk because the distance between it and the earth are increasing from each other (no it is not shrinking physically on its own, but might make for an interesting science fiction story, if you had some good theoretical science to backup your story). On the 15th it had an angular size of 8.2 arc seconds but by month's end will be only 7 arc seconds. Given this, to detect any surface detail it will require a telescope of at least 8 inch diameter. Smaller 'scopes might still be used but all you might see could be one of the faint polar caps of Mars. Good Luck!

Continuing with Mars into May, according to my sources it will be at its *EASTERN QUADRATURE* on May 4th (90 degrees "East" of the Sun), and still in the southern part of the sky at sunset. Mars is approximately 90% lighted by the sun but its angular size is very small as mentioned previously. My sources are mentioning that the Summer Solstice, the First Day of Summer will happen on Mars on May 12th of this year! By this time it is being reported that the north polar cap would be too small for it to be seen in most "amateur telescopes". I wonder? If any of you out there want a challenge set up your scopes and check out Mars North Pole. Can anyone make out the north pole of Mars yet, in May? If you did, take a photo or a sketch and bring it to the next meeting of the EAS in May! Another fun thing I have read is trying to see if you can detect Mars movement against the "fixed stars". What I have also read is that it will be moving about ½ degree per day against the stars. Can you visually see that change? Draw a sketch of Mars and the stars near it and do about a week or so sightings from night to night to see if you can detect its movement eastward! On the 31st, it decreases in brightness to 1.1 visual. At this time the distance between Earth and Mars will be around 130 million miles! Additionally, it is being suggested by some periodicals that now to try and discern any shapes on the surface of Mars, a 12 inch telescope is required? Really?

SATURN is beginning to show her stuff and nicely too! On the 15th it gleams at a 0.7 with an angular diameter of 19.3 arc minutes. She is over in southeastern horizon as night comes to us all. With the ring structure its diameter "grows" to 44 arc seconds, them rings come in mighty handy! Using a telescope try checking out her major moons, as some of them are within the range of our telescopes. She will be up for most of the night though April and May! When you see Saturn though a telescope as I have mentioned before in my column, you are just spellbound by her charm and beauty! Those Rings, WOW!

At the end of April ***NEPTUNE***, with an angular diameter of 2.2 arc seconds, shines at a 7.9 rising a few hours before the sun, in the dark of the predawn sky. Its location is near to where it was first detected 164 years ago by a German Astronomer named Johann Galle, who spotted it from the Berlin Observatory September 23, 1846! According to ASTRONOMY magazine, April 2010 by the 30th of April 2010 "Neptune lies approximately midway between the 5th mag. Stars Mu Capricorni and 38 Aquarii." Binoculars or a telescope are needed to detect it. In May this planet rises around 2 AM LDT in mid May, close to when Saturn is dips towards the western horizon, and is about 20 degrees high as a predawn sky starts to show.

JUPITER becomes easier to find toward the end of April as it is above the eastern horizon around 5 AM LDT, shinning at a -2.1and a diameter of 34.1 on the 15th of April. A waning crescent moon rises 30 minutes before Jupiter on the 11th of April. About one hour after Neptune is up, Jupiter is rising in the predawn sky of May. This month of May Jupiter's diameter increases to 36.2 arc seconds by the 15th of May, this is 6 seconds in arc bigger than one arc minute, WOW, NO, SUPERWOW! If you had a Full Moon you could divide it into 30 equal parts, each of those parts being *ONE MINUTE OF ANGULAR DIAMETER*! So, here is a reference of how big *ONE MINUTE OF ARC* is! If the sky is clear on a early spring predawn morning, and you have nothing to do for the day, fix your scope on Jupiter and see how long you can track it through the entire day (I've done it and it was a real KICK). People would come by wondering what I was looking at, in the daytime with my 11-inch CELESTRON telescope and were amazed that they could see a planet in the DAYTIME! Wonders of Wonders!

(Well this got a bit bigger than I had planned and hope there are no typos or glaring errors in logic or goof-ups with the *astrology*… oh-oh, meant ***astronomy***, sorry 'bout that!) Have a good Spring day and see you at a EAS meeting soon! Bye For now! **AD ASTRA! KEEP LOOKING UP!** (but don't trip while you're doing it).

– *John Goerger*

ASTRONOMICAL NOTES -- ON & OFF THE WEB…

COLONY OF YOUNG STARS IN ORION SHINES IN NEW SPITZER IMAGE

Astronomers have their eyes on a hot group of young stars, watching their every move like the paparazzi. A new infrared image from the Spitzer Space Telescope shows the bustling star-making colony of the Orion nebula, situated in the hunter's sword of the famous constellation. Like Hollywood starlets, the cosmic orbs don't always shine their brightest, but vary over time. Spitzer is watching the stellar show, helping scientists learn more about why the stars change, and to what degree planet formation might play a role. "*This is an exploratory project. Nobody has done this before at a wavelength sensitive to the heat from dust circling around so many stars*," said John Stauffer, the principal investigator of the research.

A colony of hot, young stars is stirring up the cosmic scene in this new picture from the Spitzer Space Telescope. The image shows the Orion nebula, a happening place where stars are born. The young stars dip and peak in brightness due to a variety of reasons. Shifting cold and hot spots on the stars' surfaces cause brightness levels to change, in addition to surrounding disks of lumpy planet-forming material, which can obstruct starlight. Spitzer is keeping tabs on the young stars, providing data on their changing ways. The hottest stars in the region, called the Trapezium cluster, are bright spots at center right. Radiation and winds from those stars has sculpted and blown away surrounding dust. The densest parts of the cloud appear dark at center left. Light from the telescope's remaining infrared channels has been color-coded: 3.6-micron light is blue and 4.5-micron light is orange. Image credit: NASA/JPL-Caltech

"*We are seeing a lot of variation, which may be a result of clumps or warped structures in the planet-forming disks*." The new image was taken after Spitzer ran out of its coolant in May 2009, beginning its extended "warm" mission. The coolant was needed to chill the instruments, but the two shortest-wavelength infrared channels still work normally at the new, warmer temperature of 30 Kelvin (minus 406 Fahrenheit). In this new phase of the mission, Spitzer is able to spend more time on projects that cover a lot of sky and require longer observation times.

One such project is the "Young Stellar Object Variability" program, in which Spitzer looks repeatedly at the same patch of the Orion nebula, monitoring the same set of about 1,500 variable stars over time. It has already taken about 80 pictures of the region over 40 days. A second set of observations will be made in fall 2010. The region's twinkling stars are about one million years old - this might invoke thoughts of wrinkle cream to a movie star, but in the cosmos, it is quite young. Our middle-aged sun is 4.6 billion years old.

Young stars are fickle, with brightness levels that change more than those of adult, sun-like stars. They also spin around faster. One reason for the ups and downs in brightness is the existence of cold spots on their surfaces. Cold spots are the opposite of "age spots" - the younger the star, the more it has. The cold spots come and go as a star whips around, changing the amount of light that reaches our telescopes.

Stellar brightness can also change due to hot spots, which are caused by gas accreting onto a young star from the material out of which it formed. "*In the 1950s and 60s, astronomers knew that younger stars varied, and they postulated this had something to do with the birthing process*," said Stauffer. "*Later, with improved technology, we could see a lot more and learned a great deal about the stars' spots*."

Spitzer is particularly suited to study yet another reason why the stars are changing. The telescope's infrared sight can see the warm, dusty disks orbiting around them. These disks are where planets may eventually clump together and form. When the disks are young, they can have asymmetries, possibly caused by forming planets or gravitational disturbances from formed planets. As the skewed disks circle around a star, they block varying amounts of starlight.

By gathering more and more data on these varying disks, Stauffer and his team hope to learn more about how planets develop -- not exactly tabloid fodder, but an ongoing drama of one large, stellar family. http://www.jpl.nasa.gov/news/news.cfm?release=2010-108&cid=release_2010-108 http://www.spitzer.caltech.edu/spitzer http://www.nasa.gov/spitzer

THE SUN COMES BACK TO LIFE

After the most profound lull in solar activity for nearly a century, the Sun is finally coming back to life. But will the solar activity return to previous levels? ESA's venerable solar watchdog SOHO is there, watching and measuring, providing unique information about our nearest star. It was the perfect Christmas present for solar physicists. In mid-December 2009, the largest group of sunspots to emerge for several years manifested itself on the solar surface. It occurred just as some solar physicists were beginning to wonder if large sunspots would ever return. "*This last minimum was much deeper and longer than anybody predicted*," says Bernhard Fleck, ESA's SOHO Project Scientist, "*We were beginning to joke that we had entered another Maunder minimum*."

The Maunder minimum occurred between 1645 and 1715, when sunspots, the visible markers of solar activity, were largely absent from the Sun. The last two years have been the same, with the Sun presenting a spotless face for more than 70% of the time.

Astronomers are used to seeing the Sun sweep through a cycle of activity that lasts approximately 11 years. But until December last year, the Sun had seemed reluctant to start up again. In mid-January, an even larger sunspot group emerged and, most recently, several big, active areas have been crossing the face of the Sun. Yet it is premature to believe that the Sun is ramping up for another energetic cycle of activity.

Artist's impression of the SOHO spacecraft

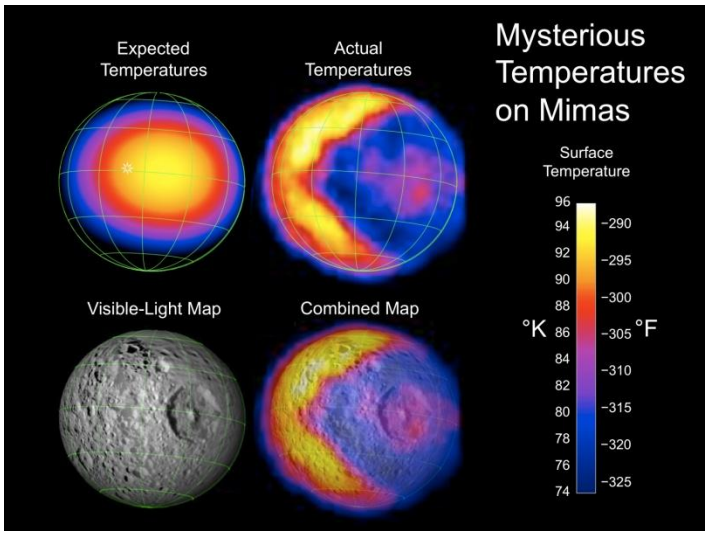
The strength of the upcoming solar cycle is determined by the strength of magnetism at the poles of the Sun, and this is currently very weak. The polar field provides the magnetic 'seeds' for the next cycle's sunspots by being swallowed down inside the Sun, somehow rejuvenated and then returned to the surface to appear as the dark blemishes. Solar activity returned in late 2009. So, although the Sun is coming back to life, we should not expect that much activity according to Fleck. "*I think we are heading for something like the early 20th century when everything was much less active*," he says. Historical records show that, until the last few years, the solar cycle has been unusually active. So, rather than a sudden drop in activity, this is more like a return to normality. "*When SOHO was launched almost 15 years ago, understanding the solar cycle was not one of its scientific objectives, now it is one of the key questions*," says Fleck.

As newer spacecraft, such as the Solar Dynamics Observatory are launched, SOHO's continued observations will provide essential calibration data for the newer instruments, ensuring that the astronomers can compare the datasets accurately. And SOHO still has one unique capability: it remains the only spacecraft in line with the Sun that can watch for 'coronal mass ejections' coming straight for Earth, which can disrupt telecommunications, GPS and power lines.

MIMAS – DEATH STAR, OR PAC-MAN ?

The highest-resolution-yet temperature map and images of Saturn's icy moon Mimas obtained by the Cassini spacecraft reveal surprising patterns on the surface of the small moon, including unexpected hot regions that resemble "Pac-Man" eating a dot, and striking bands of light and dark in crater walls. "*Other moons usually grab the spotlight, but it turns out Mimas is more bizarre than we thought it was*," said Linda Spilker, Cassini project scientist. "*It has certainly given us some new puzzles*." Cassini collected the data on Feb. 13, during its closest flyby of the moon, which is marked by an enormous scar called Herschel Crater and resembles the Death Star space station from "Star Wars."

Scientists working with the composite infrared spectrometer, which mapped Mimas' temperatures, expected smoothly varying temperatures peaking in the early afternoon near the equator. Instead, the warmest region was in the morning, along one edge of the moon's disk, making a sharply defined Pac-Man shape, with temperatures around 92 Kelvin (minus 294 degrees Fahrenheit). The rest of the moon was much colder, around 77 Kelvin (minus 320 degrees Fahrenheit). A smaller warm spot - the dot in Pac-Man's mouth - showed up around Herschel, with a temperature around 84 Kelvin (-310 degrees F).



*This figure illustrates the unexpected and bizarre pattern of daytime temperatures found on Mimas (396 kms, or 246 mi. diameter). The data were obtained by the composite infrared spectrometer (CIRS) on Cassini. The upper left image shows the **expected** distribution of temperatures. The white sun symbol shows the point where the sun is directly overhead, which is at midday close to the equator. Just as on Earth, the highest temperatures (shown in yellow) were expected to occur after midday, in the early afternoon. The upper right image shows the completely different pattern that Cassini **actually** saw. Instead of the expected smoothly varying temperatures, this side of Mimas is divided into a warm part (on the left) and a cold part (on the right) with a sharp, v-shaped boundary between them. The warm part has typical temperatures near 92 Kelvin (-294 F), while typical temperatures on the cold part are about 77 Kelvin (-320 F). The cold part is probably colder because surface materials there have a greater thermal conductivity, so the sun's energy soaks into the subsurface instead of warming the surface itself. But why conductivity should vary so dramatically across the surface of Mimas is a mystery. The lower two panels compare the temperature map to Mimas' appearance in ordinary visible light at the time of the observations. The cold side includes the giant Herschel Crater, which is a few degrees warmer than its surroundings. It's not yet known whether Herschel is responsible in some way for the larger region of cold temperatures that surrounds it. The green grid shows latitudes and longitudes on Mimas at 30-degree intervals.*

The warm spot around Herschel makes sense because tall crater walls (about 5 kilometers, or 3 miles, high) can trap heat inside the crater. But scientists were completely baffled by the sharp, V-shaped pattern. "*We suspect the temperatures are revealing differences in texture on the surface*," said John Spencer, a Cassini composite infrared spectrometer team member. "*It's maybe something like the difference between old, dense snow and freshly fallen powder*." Denser ice quickly conducts the heat of the sun away from the surface, keeping it cold during the day. Powdery ice is more insulating and traps the sun's heat at the surface, so the surface warms up.

Even if surface texture variations are to blame, scientists are still trying to figure out why there are such sharp boundaries between the regions, Spencer said. It is possible that the impact that created Herschel Crater melted surface ice and spread water across the moon. That liquid may have flash-frozen into a hard surface. But it is hard to understand why this dense top layer would remain intact when meteorites and other space debris should have pulverized it by now, Spencer said.

Icy spray from the E ring, one of Saturn's outer rings, should also keep Mimas relatively light-colored, but the new visible-light images from the flyby paint a picture of surprising contrasts. Cassini imaging team scientists didn't expect to see dark streaks trailing down the bright crater walls or a continuous, narrow pile of concentrated dark debris tracing the foot of each wall. The pattern may appear because of the way the surface of Mimas ages, said Paul Helfenstein, a Cassini imaging team associate. Over time, the moon's surface appears to accumulate a thin veil of silicate minerals or carbon-rich particles, possibly because of meteor dust falling onto the moon, or impurities already embedded in surface ice. As the sun's warming rays and the vacuum of space evaporate the brighter ice, the darker material is concentrated and left behind. Gravity pulls the dark material down the crater walls, exposing fresh ice underneath. Although similar effects are seen on other moons of Saturn, the visibility of these contrasts on a moon continually re-paved with small particles from the E ring helps scientists estimate rates of change on other satellites. "*These processes are not unique to Mimas, but the new high-definition images are like Rosetta stones for interpreting them*," Helfenstein said. http://www.jpl.nasa.gov/news/news.cfm?release=2010-103&cid=release_2010-103 http://www.nasa.gov/cassini

ASHES TO ASHES, DUST TO DUST: CHANDRA/SPITZER IMAGE

A new image from Chandra and Spitzer space telescopes shows the dusty remains of a collapsed star. The dust is flying past and engulfing a nearby family of stars. "*Scientists think the stars in the image are part of a stellar cluster in which a supernova exploded*," said Tea Temin, who led the study. "*The material ejected in the explosion is now blowing past these stars at high velocities*."

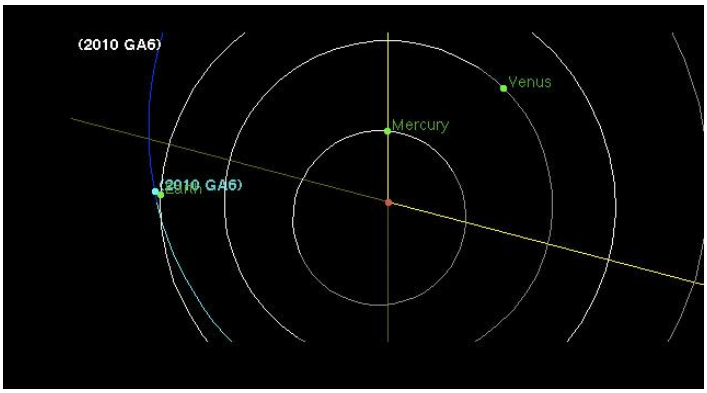
This composite image of G54.1+0.3 shows Chandra X-ray Observatory data in blue, data from the Spitzer Space Telescope in green (shorter wavelength) and red-yellow (longer). The white source near the center of the image is a dense, rapidly rotating neutron star, or pulsar, left behind after a core-collapse supernova explosion. The pulsar generates a wind of high-energy particles (seen in Chandra data) that expands into the surrounding environment, illuminating the material ejected in the supernova explosion. http://photojournal.jpl.nasa.gov/catalog/?IDNumber=pia12982

The infrared shell that surrounds the pulsar wind is made up of gas and dust that condensed out of debris from the supernova. As the cold dust expands into the surroundings, it is heated and lit up by the stars in the cluster so that it is observable in infrared. The dust closest to the stars is the hottest and is seen glowing in yellow in the image. Some of the dust is also being heated by the expanding pulsar wind as it overtakes the material in the shell. The unique environment into which this supernova exploded makes it possible for astronomers to observe the condensed dust from the supernova that is usually too cold to emit in infrared. Without the presence of the stellar cluster, it would not be possible to observe this dust until it becomes energized and heated by a shock wave from the supernova. However, the very action of such shock heating would destroy many of the smaller dust particles. In G54.1+0.3, astronomers are observing pristine dust before any such destruction.

G54.1+0.3 provides an exciting opportunity for astronomers to study the freshly formed supernova dust before it becomes altered and destroyed by shocks. The nature and quantity of dust produced in supernova explosions is a long-standing mystery, and G54.1+0.3 supplies an important piece to the puzzle. The Spitzer observations were made before the telescope ran out of its coolant in May 2009 and began its "warm" mission. http://www.jpl.nasa.gov/news/news.cfm?release=2010-102&cid=release_2010-102 http://www.spitzer.caltech.edu/spitzer http://www.nasa.gov/spitzer http://chandra.harvard.edu http://chandra.nasa.gov

ASTEROID FLIES BY, WITHIN MOON'S ORBIT, ON APRIL 8TH

A newly discovered asteroid, 2010 GA6, will safely fly by Earth Thursday April 8th at 4:06 p.m. Pacific (23:06 U.T.C.). At time of closest approach 2010 GA6 will be about 359,000 kilometers (223,000 miles) away from Earth - about 9/10ths the distance to the moon. The asteroid, approximately 22 meters (71 feet) wide, was discovered by the Catalina Sky Survey. "Fly bys of near-Earth objects within the moon's orbit occur every few weeks," said Don Yeomans of NASA's Near-Earth Object Office.

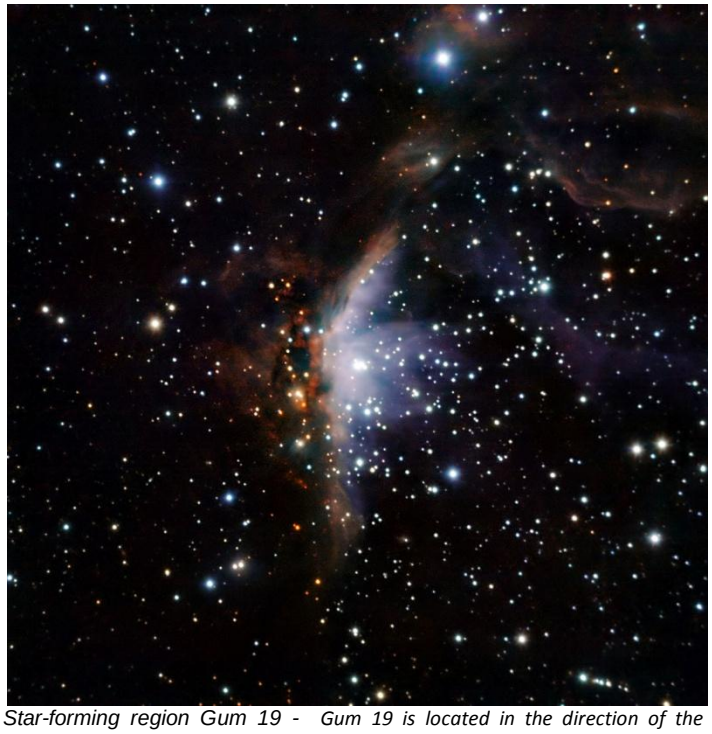


NASA detects and tracks asteroids and comets passing close to Earth using both ground and space-based telescopes. The Near-Earth Object Observations Program, commonly called "Spaceguard," discovers these objects, characterizes a subset of them and plots their orbits to determine if any could be potentially hazardous to our planet. For

more information about asteroids and near-Earth objects, visit: http://www.jpl.nasa.gov/asteroidwatch

THE LIGHT AND DARK FACE OF A STAR-FORMING NEBULA

Today, ESO is unveiling an image of the little known Gum 19, a faint nebula that, in the infrared, appears dark on one half and bright on the other. On one side hot hydrogen gas is illuminated by a supergiant blue star called V391 Velorum. New star formation is taking place within the ribbon of luminous and dark material that brackets V391 Velorum's left in this perspective. After many millennia, these fledgling stars, coupled with the explosive demise of V391 Velorum as a supernova, will likely alter Gum 19's present Janus-like appearance. Gum 19 is located in the direction of the constellation Vela (the Sail) at a distance of approximately 22 000 light years. The Gum 19 moniker derives from a 1955 publication by the Australian astrophysicist Colin S. Gum that served as the first significant survey of so-called HII (read "H-two") regions in the southern sky. HII refers to hydrogen gas that is ionized, or energized to the extent that the hydrogen atoms lose their electrons. Such regions emit light at well-defined wavelengths (or colors), thereby giving these cosmic clouds their characteristic glow. And indeed, much like terrestrial clouds, the shapes and textures of these HII regions change as time passes, though over the course of eons rather than before our eyes. For now, Gum 19 has somewhat of a science fiction-esque, "rip in space-time" look to it in this image, with a narrow, near-vertical bright region slashing across the nebula. Looking at it, you could possibly see a resemblance to a two-toned angelfish or an arrow with a darkened point.



Star-forming region Gum 19 - Gum 19 is located in the direction of the constellation Vela (the Sail) at a distance of approximately 22,000 light years. The furnace that fuels Gum 19's luminosity is a gigantic, superhot star called V391 Velorum. Shining brightest in the scorching blue range of visible light — V391 Velorum boasts a surface temperature in the vicinity of 30 000 degrees Celsius. Within the neighborhood of this fitful supergiant, new stars nonetheless continue to grow. In several million years — a blink of an eye in cosmic time — they will eventually reach the high density at their centers necessary to ignite nuclear fusion. The fresh outpouring of energy and stellar winds from these newborn stars will also modify the gaseous landscape of Gum 19. The image is based on data obtained in three near-infrared bands (J, H, K; associated respectively to blue, green, and red). The image is 4.7 arc minutes across. Credit: ESO

This new image of the evocative Gum 19 object was captured by an infrared instrument called SOFI, mounted on ESO's New Technology Telescope (NTT) that operates at the La Silla Observatory in Chile. SOFI stands for Son of ISAAC, after the "father" instrument, ISAAC, that is located at ESO's Very Large Telescope observatory at Paranal to the north of La Silla. Observing this nebula in the infrared allows astronomers to see through at least parts of the dust.

The furnace that fuels Gum 19's luminosity is a gigantic, superhot star called V391 Velorum. Shining brightest in the scorching blue range of visible light, V391 Velorum boasts a surface temperature in the vicinity of 30 000 degrees Celsius. This massive star has a temperamental nature, however, and is categorized as a variable star accordingly. V391 Velorum's brightness can fluctuate suddenly as a result of strong activity that can include ejections of shells of matter, which contribute to Gum 19's composition and light emissions. Stars on the grand scale of V391 Velorum do not burn bright for long, and after a relatively short lifetime of about ten million years these titans blow up as supernovae. These explosions, which temporarily rival whole galaxies in their light intensity, blast heated matter in surrounding space, an event that can radically change the color and shape of its enclosing nebula. As such, V391 Velorum's death throes may well leave Gum 19 unrecognizable.

Within the neighborhood of this fitful supergiant, new stars nonetheless continue to grow. HII regions denote sites of active star formation wherein great quantities of gas and dust have begun to collapse under their own gravity. In several million years — a blink of an eye in cosmic time — these shrinking knots of matter will eventually reach the high density at their centers necessary to ignite nuclear fusion. The fresh outpouring of energy and stellar winds from these newborn stars will also modify the gaseous landscape of Gum 19.

This image shows the area around the star-forming region Gum 19, in the direction of the constellation of Vela (the Sail), as seen by the Digitized Sky Survey 2. The image covers an area of 3 times 3 degrees on the sky. Credit: ESO/Digitized Sky Survey 2

TRITON'S SUMMER SKY OF METHANE AND CARBON MONOXIDE

According to the first ever infrared analysis of the atmosphere of Neptune's moon Triton, summer is in full swing in its southern hemisphere. The European observing team used ESO's Very Large Telescope and discovered carbon monoxide and made the first ground-based detection of methane in Triton's thin atmosphere. These observations revealed that the thin atmosphere varies seasonally, thickening when warmed. "*We have found real evidence that the Sun still makes its presence felt on Triton, even from so far away. This icy moon actually has seasons just as we do on Earth, but they change far more slowly*," says Emmanuel Lellouch, the lead author of the paper reporting these results. On Triton, where the average surface temperature is about -235 degrees Celsius, it is currently summer in the southern hemisphere and winter in the northern. As Triton's southern hemisphere warms up, a thin layer of frozen nitrogen, methane, and carbon monoxide on Triton's surface sublimates into gas, thickening the icy atmosphere as the season progresses during Neptune's 165-year orbit around the Sun. A season on Triton lasts a little over 40 years, and Triton passed the southern summer solstice in 2000. Based on the amount of gas measured, Lellouch and his colleagues estimate that Triton's atmospheric pressure may have risen by a factor of four compared to the measurements made by Voyager 2 in 1989, when it was still spring on the giant moon. The atmospheric pressure on Triton is now between 40 and 65 microbars — 20,000 times less than on Earth.

Artist's impression of how Triton, Neptune's largest moon, might look from high above its surface. The distant Sun appears at the upper-left and the blue crescent of Neptune right of center. Using the CRIRES instrument on ESO's Very Large Telescope, a team of astronomers has been able to see that the summer is in full swing in Triton's southern hemisphere. Credit: ESO/L. Calçada

Carbon monoxide was known to be present as ice on the surface, but Lellouch and his team discovered that Triton's upper surface layer is enriched with carbon monoxide ice by about a factor of ten compared to the deeper layers, and that it is this upper "film" that feeds the atmosphere. While the majority of Triton's atmosphere is nitrogen (much like on Earth), the methane in the atmosphere, first detected by Voyager 2, and only now confirmed in this study from Earth, plays an important role as well. "*Climate and atmospheric models of Triton have to be revisited now, now that we have found carbon monoxide and re-measured the methane*," says co-author Catherine de Bergh.

Of Neptune's 13 moons, Triton is by far the largest, and, at 2700 kilometers in diameter (or three quarters the Earth's Moon), is the seventh largest moon in the whole Solar System. Since its discovery in 1846, Triton has fascinated astronomers thanks to its geologic activity, the many different types of surface ices, such as frozen nitrogen as well as water and dry ice (frozen carbon dioxide), and its unique retrograde motion. Observing the atmosphere of Triton, which is roughly 30 times further from the Sun than Earth, is not easy. In the 1980s, astronomers theorized that the atmosphere on Neptune's moon might be as thick as that of Mars (7 millibars). It wasn't until Voyager 2 passed the planet in 1989 that the atmosphere of nitrogen and methane, at an actual pressure of 14 microbars, 70 000 times less dense than the atmosphere on Earth, was measured. Since then, ground-based observations have been limited. Observations of stellar occultations (a phenomenon that occurs when a Solar System body passes in front of a star and blocks its light) indicated that Triton's surface pressure was increasing in the 1990's. It took the development of the Cryogenic High-Resolution Infrared Echelle Spectrograph (CRIRES) at the Very Large Telescope (VLT) to provide the team the chance to perform a far more detailed study of Triton's atmosphere. "*We needed the sensitivity and capability of CRIRES to take very detailed spectra to look at the very tenuous atmosphere*," says co-author Ulli Käufl. The observations are part of a campaign that also includes a study of Pluto.

Pluto, often considered a cousin of Triton and with similar conditions, is receiving renewed interest in the light of the carbon monoxide discovery, and astronomers are racing to find this chemical on the even more distant dwarf planet. This is just the first step for astronomers using CRIRES to understand the physics of distant bodies in the Solar System. "*We can now start monitoring the atmosphere and learn a lot about the seasonal evolution of Triton over decades*," Lellouch says. Triton is the only large moon in the Solar System with a retrograde motion, which is a motion in the opposite direction to its planet's rotation. This is one of the reasons why Triton is thought to have

WHY MANY SURVEYS OF DISTANT GALAXIES MISS 90% OF THEIR TARGETS

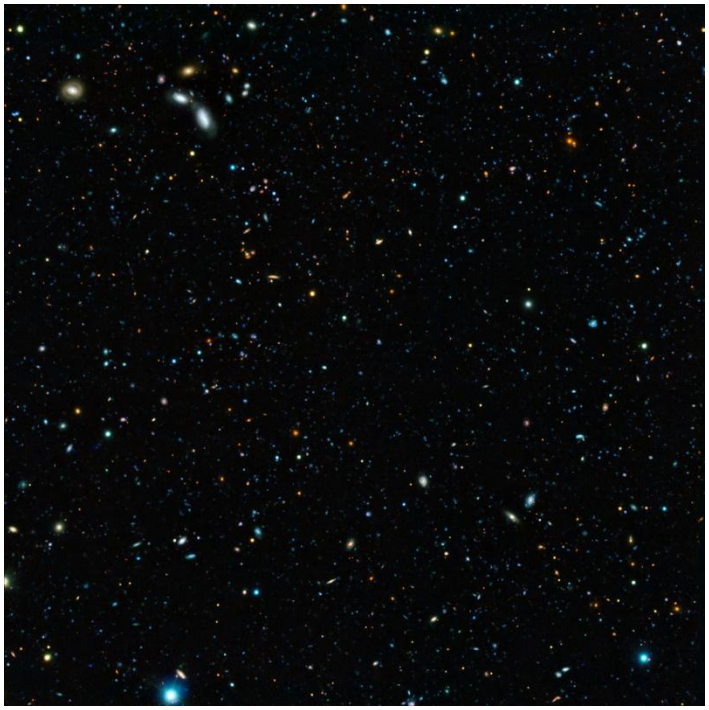
Astronomers have long known that in many surveys of the very distant Universe, a large fraction of the total intrinsic light was not being observed. Now, thanks to an extremely deep survey using two of the four giant 8.2-metre telescopes that make up ESO's Very Large Telescope (VLT) and a unique custom-built filter, astronomers have determined that a large fraction of galaxies whose light took 10 billion years to reach us have gone undiscovered. The survey also helped uncover some of the faintest galaxies ever found at this early stage of the Universe.

Astronomers frequently use the strong, characteristic "fingerprint" of light emitted by hydrogen known as the Lyman-alpha line, to probe the amount of stars formed in the very distant Universe. Yet there have long been suspicions that many distant galaxies go unnoticed in these surveys. A new VLT survey demonstrates for the first time that this is exactly what is happening. Most of the Lyman-alpha light is trapped within the galaxy that emits it, and 90% of galaxies do not show up in Lyman-alpha surveys. "*Astronomers always knew they were missing some fraction of the galaxies in Lyman-alpha surveys*," explains Matthew Hayes, the lead author of the paper, "*but for the first time we now have a measurement. The number of missed galaxies is substantial*."

To figure out how much of the total luminosity was missed, Hayes and his team used the FORS camera at the VLT and a custom-built narrowband filter to measure this Lyman-alpha light, following the methodology of standard Lyman-alpha surveys. Then, using the new HAWK-I camera, attached to another VLT Unit Telescope, they surveyed the same area of space for light emitted at a different wavelength, also by glowing hydrogen, and known as the H-alpha line. They specifically looked at galaxies whose light has been travelling for 10 billion years (redshift 2.2), in a well-studied area of the sky, known as the GOODS-South field.

"*This is the first time we have observed a patch of the sky so deeply in light coming from hydrogen at these two very specific wavelengths, and this proved crucial*," says team member Göran Östlin. The survey was extremely deep, and uncovered some of the faintest galaxies known at this early epoch in the life of the Universe. The astronomers could thereby conclude that traditional surveys done using Lyman-alpha only see a tiny part of the total light that is produced, since most of the Lyman-alpha photons are destroyed by interaction with the interstellar clouds of gas and dust. This effect is dramatically more significant for Lyman-alpha than for H-alpha light. As a result, many galaxies, a proportion as high as 90%, go unseen by these surveys. "*If there are ten galaxies seen, there could be a hundred there*," Hayes says.

Different observational methods, targeting the light emitted at different wavelengths, will always lead to a view of the Universe that is only partially complete. The results of this survey issue a stark warning for cosmologists, as the strong Lyman-alpha signature becomes increasingly relied upon in examining the very first galaxies to form in the history of the Universe. "*Now that we know how much light we've been missing, we can start to create far more accurate representations of the cosmos, understanding better how quickly stars have formed at different times in the life of the Universe*," says co-author Miguel Mas-Hesse.



This composite image of the GOODS-South field — the result of an extremely deep survey using two of the four giant 8.2-metre telescopes composing ESO's Very Large Telescope (VLT) and a unique custom-built filter — shows some of the faintest galaxies ever seen. It also allows astronomers to determine that 90% of galaxies whose light took 10 billion years to reach us have gone undiscovered. The image is based on data acquired with the FORS and HAWK-I instruments on the VLT. It shows in particular two varieties of light emitted by excited hydrogen atoms, known as Lyman-alpha and H-alpha. Credit: ESO/M. Hayes

The breakthrough was made possible thanks to the unique camera used. HAWK-I, which saw first light in 2007, is a state-of-the-art instrument. "*There are only a few other cameras with a wider field of view than HAWK-I, and they are on telescopes less than half the size of the VLT. So only VLT/HAWK-I, really, is capable of efficiently finding galaxies this faint at these distances*," says team member Daniel Schaerer.

Lyman-alpha light corresponds to light emitted by excited hydrogen (more specifically, when the electron around the nucleus jumps from the first excited level to the fundamental, or ground, level). This light is emitted in the ultraviolet, at 121.6 nm. The Lyman-alpha line is the first in the so-called Lyman series, named after its discoverer, Theodore Lyman. The Balmer series, named after Johann Balmer, also corresponds to light emitted by excited hydrogen. In this case, the electron falls into the first excited level. The first line in this series is the H-alpha line, emitted at 656.3 nm. As most hydrogen atoms present in a galaxy are in the ground level, Lyman-alpha light is more efficiently absorbed than H-alpha light, which requires atoms having an electron in the second level. As this is very uncommon in the cold interstellar hydrogen permeating galaxies, the gas is almost perfectly transparent to H-alpha light. A narrowband filter is an optical filter designed to let pass only a narrow bandwidth of light, centered on a specific wavelength. Traditional narrowband filters include those centered on the lines of the Balmer series, such as H-alpha.

Because the Universe expands, the light of a distant object is red-shifted by an amount depending on its distance. This means its light is moved towards longer wavelengths. A redshift of 2.2 — corresponding to galaxies whose light has taken approximately 10 billion years to reach us — means that the light is stretched by a factor 3.2. Thus the Lyman–alpha light is now seen at about 390 nm, near the visible domain, and can be observed with the FORS instrument on ESO's VLT, while the H-alpha line is moved towards 2.1 microns, in the near-infrared. It can thus be observed with the HAWK-I instrument on the VLT.

ASTRONOMERS TAKE CLOSE-UPS OF MYSTERIOUS EPSILON AURIGAE

For the first time, astronomers have directly observed the mysterious dark companion in a binary star system that has puzzled sky watchers since the 19th century. Scientists have taken close-up pictures of Epsilon Aurigae during its eclipse, which happens every 27 years. "Close up" in this case is a relative term, but the images zoom in enough to show the shape of the dark object's shadow. "*Seeing is believing*," said John Monnier, who is an author of a paper about the research.

Epsilon Aurigae is the fifth brightest star in the northern constellation Auriga. For more than 175 years, astronomers have known it is dimmer than it should be, given its mass. They also noticed its brightness dip for more than a year every few decades. They surmised that it was a binary system in which one companion was invisible. But what type of object was the companion? Because astronomers hadn't observed much light from it, the prevailing theory labeled it a smaller star orbited edge-on by a thick disk of dust. The theory held that the disk's orbit must be in precisely the same plane as the dark object's orbit around the brighter star, and all of this had to be occurring in the same plane as Earth's vantage point. This would be an unlikely alignment, but it explained observations. The new images show that this is indeed the case. A geometrically thin, dark, dense, but partially translucent cloud can be seen passing in front of Epsilon Aurigae.

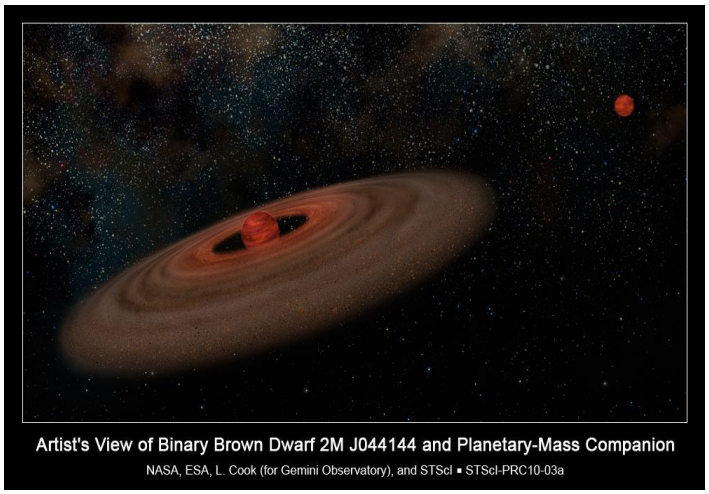
"*This really shows that the basic paradigm was right, despite the slim probability*," Monnier said. "*It kind of blows my mind that we could capture this. There's no other system like this known. On top of that, it seems to be in a rare phase of stellar life. And it happens to be so close to us. It's extremely fortuitous*." The disk appears much flatter than recent modeling from the Spitzer Space Telescope suggests, Monnier said. "*It's really flat as a pancake*," he said.

Monnier led the creation of the Michigan Infra-Red Combiner (MIRC) instrument that was used to produce these images. MIRC uses a process called "interferometry" to combine the light entering four

telescopes at the CHARA array at Georgia State University and amplify it so that it seems to be coming through a device 100 times larger than the Hubble Space Telescope. MIRC allowed astronomers to see the shape and surface characteristics of stars for the first time. Previously, stars were mere points of light even with the largest telescopes. "*Interferometry has made high resolution imaging of distant objects a reality*," said Fabien Baron, a post-doctoral researcher who helped with the imaging in this study. "*It most probably will solve many mysteries but also raise many new questions*." video - http://www.ns.umich.edu/podcast/video.php?id=1211

SMALL BROWN DWARF COMPANION CHALLENGES SIMPLE DEFINITION

As telescopes grow more powerful, astronomers are uncovering objects that defy conventional wisdom. The latest example is the discovery of a planet-like object circling a brown dwarf. It's the right size for a planet, estimated to be 5-10 times the mass of Jupiter. But the object formed in less than 1 million years — the approximate age of the brown dwarf — and much faster than the predicted time it takes to build planets according to some theories. Kamen Todorov and co-investigators used the keen eyesight of the Hubble Space Telescope and the Gemini Observatory to directly image the companion of the brown dwarf, which was uncovered in a survey of 32 young brown dwarfs in the Taurus star-forming region. Brown dwarfs are objects that typically are tens of times the mass of Jupiter and are too small to sustain nuclear fusion to shine as stars do. The mystery object orbits the nearby brown dwarf at a separation of approximately 2.25 billion miles (3.6 billion kilometers — which is between the distances of Saturn and Uranus from the Sun).



Artist's conception of the binary system 2M J044144 showing the primary brown dwarf that is estimated to be approximately 20 times the mass of Jupiter (at left) and its companion that is estimated to be 7 times the mass of Jupiter (at right). The disk of the primary likely never had enough material to make a companion of this mass. As a result, this small companion probably formed like a binary star. In this illustration, both objects are presented at the same distance to show relative sizes. Not shown are two other nearby objects, a low-mass star and a brown dwarf that are probably both parts of this system. Science Credit: NASA, ESA, and K. Todorov and K. Luman (Penn State University) Artwork Credit: Gemini Observatory, courtesy of L. Cook

There has been a lot of discussion in the context of the Pluto debate over how small an object can be and still be called a planet. This new observation addresses the question at the other end of the size spectrum: How small can an object be and still be a brown dwarf rather than a planet? This new companion is within the range of masses observed for planets around stars — less than 15 Jupiter masses. But should it be called a planet? The answer is strongly connected to the mechanism by which the companion most likely formed.

There are three possible formation scenarios: Dust in a circum-stellar disk slowly agglomerates to form a rocky planet 10 times larger than Earth, which then accumulates a large gaseous envelope; a lump of gas in the disk quickly collapses to form an object the size of a gas giant planet; or, rather than forming in a disk, a companion forms directly from the collapse of the vast cloud of gas and dust in the same manner as a star (or brown dwarf). If the last scenario is correct, then this discovery demonstrates that planetary-mass bodies can be made through the same mechanism that builds stars. This is the likely solution because the companion is too young to have formed by the first scenario, which is very slow. The second mechanism occurs rapidly, but the disk around the central brown dwarf probably did not contain enough material to make an object with a mass of 5-10 Jupiter masses.

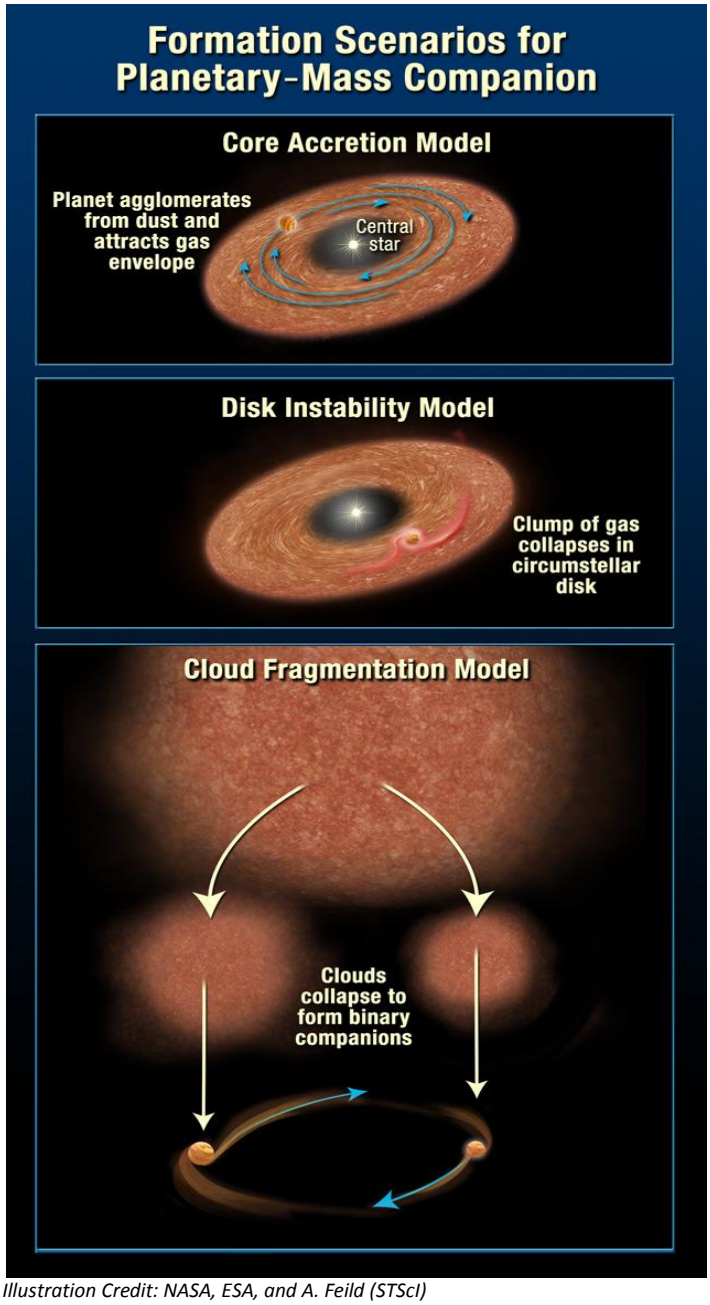
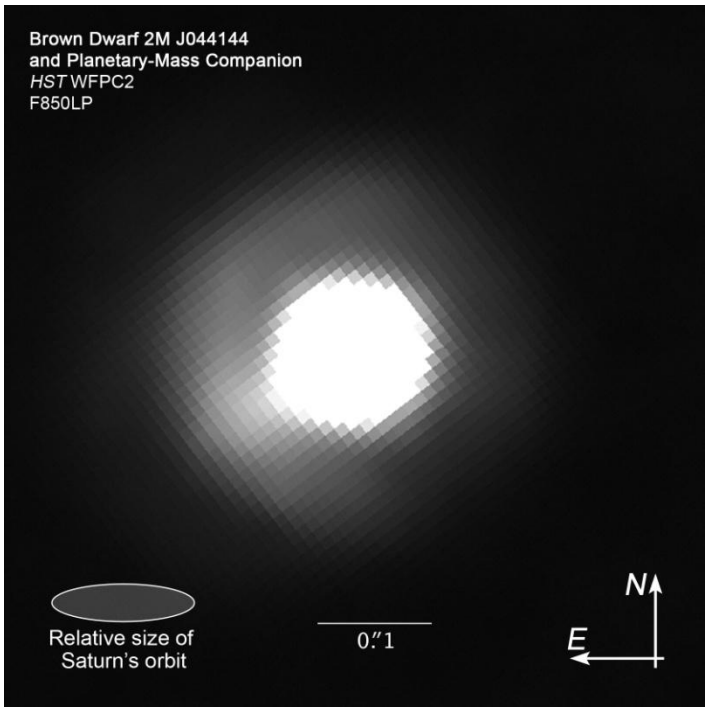


Illustration Credit: NASA, ESA, and A. Feild (STScI)

"*The most interesting implication of this result is that it shows that the process that makes binary stars extends all the way down to planetary masses. So it appears that nature is able to make planetary-mass companions through two very different mechanisms*," says team

member Kevin Luhman. If the mystery companion formed through cloud collapse and fragmentation, as stellar binary systems do, then it is not a planet by definition because planets build up inside disks.

The mass of the companion is estimated by comparing its brightness to the luminosities predicted by theoretical evolutionary models for objects at various masses for an age of 1 million years. Further supporting evidence comes from the presence of a very nearby binary system that contains a small red star and a brown dwarf. Luhman thinks that all four objects may have formed in the same cloud collapse, making this in actuality a quadruple system.



Credit: NASA, ESA, and Z. Levay (STScI)

"*The configuration closely resembles quadruple star systems, suggesting that all of its components formed like stars*," says Luhman.

EXPERIENCE HST'S UNIVERSE IN IMAX 3-D WITH "HUBBLE 3D"

Take an exhilarating ride through the Orion Nebula, a vast star-making factory 1,500 light-years away. Swoop through Orion's giant canyon of gas and dust. Fly past behemoth stars whose brilliant light illuminates and energizes the entire cloudy region. Zoom by dusty tadpole-shaped objects that are fledgling solar systems. This virtual space journey isn't the latest video game but one of several groundbreaking astronomy visualizations created by specialists at the Space Telescope Science Institute (STScI), the science operations center for Hubble Space Telescope. The cinematic space odysseys are part of the new Imax film "Hubble 3D," which opened recently at select Imax theaters worldwide. The 43-minute movie chronicles the 20-year life of Hubble and includes highlights from the 2009 servicing mission to the Earth-orbiting observatory, with footage taken by the astronauts. The giant-screen film showcases some of Hubble's breathtaking iconic pictures, such as the Eagle Nebula's "Pillars of Creation," as well as stunning views taken by the newly installed Wide Field Camera 3.

While Hubble pictures of celestial objects are awe-inspiring, they are flat 2-D photographs. For this film, those 2-D images have been converted into 3-D environments, giving the audience the impression they are space travelers taking a tour of Hubble's most popular targets. "*A large-format movie is a truly immersive experience*," says Frank Summers, a STScI astronomer and science visualization specialist who led the team that developed the movie visualizations. The team labored for nine months, working on four visualization sequences that comprise about 12 minutes of the movie. "*Seeing these Hubble images in 3-D, you feel like you are flying through space and not just looking at picture postcards*," Summers continued. "*The spacescapes are all based on Hubble images and data, though some artistic license is necessary to produce the full depth of field needed for 3-D*."

The most ambitious sequence is a four-minute voyage through the Orion Nebula's gas-and-dust canyon, about 15 light-years across. During the ride, viewers will see bright and dark, gaseous clouds; thousands of stars, including a grouping of bright, hefty stars called the Trapezium; and embryonic planetary systems. The tour ends with a detailed look at a young circumstellar disk, which is much like the structure from which our solar system formed 4.5 billion years ago. Based on a Hubble image of Orion released in 2006, the visualization was a collaborative effort between science visualization specialists at STScI, including Greg Bacon, who sculpted the Orion Nebula digital model, with input from STScI astronomer Massimo Roberto.

For some of the sequences, STScI imaging specialists developed new techniques for transforming the 2-D Hubble images into 3-D. STScI image processing specialists Lisa Frattare and Zolt Levay, for example, created methods of splitting a giant gaseous pillar in the Carina Nebula into multiple layers to produce a 3-D effect, giving the structure depth. The Carina Nebula is a nursery for baby stars. Frattare painstakingly removed the thousands of stars in the image so that Levay could separate the gaseous layers on the isolated Carina pillar. Frattare then replaced the stars into both foreground and background layers to complete the 3-D model. For added effect, the same separation was done for both visible and infrared Hubble images, allowing the film to cross-fade between wavelength views in 3-D.

In another sequence viewers fly into a field of 170,000 stars in the giant star cluster Omega Centauri. STScI astronomer Jay Anderson used his stellar database to create a synthetic star field in 3-D that matches recent razor-sharp Hubble photos.

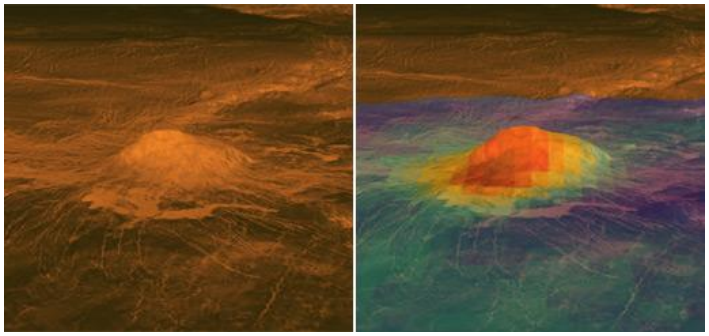
The film's final four-minute sequence takes viewers on a voyage from our Milky Way Galaxy past many of Hubble's best galaxy shots and deep into space. Some 15,000 galaxies from Hubble's deepest surveys stretch billions of light-years across the universe in a 3-D sequence created by STScI astronomers and visualizers. The view dissolves into a cobweb that traces the universe's large-scale structure, the backbone from which galaxies were born. In addition to creating visualizations, STScI's education group also provided guidance on the "Hubble 3D" Educator Guide, which includes standards-based lesson plans and activities about Hubble and its mission. Students will use the guide before or after seeing the movie. "*The guide will enhance the movie experience for students and extend the movie into classrooms*," says Bonnie Eisenhamer, STScI's Hubble Formal Education manager. http://hubblesite.org/news/2010/12

RESEARCH SUGGESTS VENUS IS GEOLOGICALLY ALIVE – VOLCANICALLY ACTIVE

For the first time, scientists have detected clear signs of recent lava flows on the surface of Venus. The observations reveal that volcanoes on Venus appeared to erupt between a few hundred years to 2.5 million years ago. This suggests the planet may still be geologically active, making Venus one of the few worlds in our solar system that has been volcanically active within the last 3 million years. The evidence comes from the European Space Agency's Venus Express mission, which has been in orbit around the planet since April 2006. The science results were laid over topographic data from the Magellan spacecraft. Magellan radar-mapped 98 percent of the surface and collected high-resolution gravity data while orbiting Venus from 1990 to 1994.

Scientists see compositional differences compared to the surrounding landscape in three volcanic regions. Relatively young lava flows have been identified by the way they emit infrared radiation. These observations suggest Venus is still capable of volcanic eruptions. The findings appear in the April 8 edition of the journal Science.

"*The geological history of Venus has long been a mystery*," said Sue Smrekar, lead author of the paper describing the work. "*Previous spacecraft gave us hints of volcanic activity, but we didn't know how long ago that occurred. Now we have strong evidence right at the surface for recent eruptions*."



This figure shows the volcanic peak Idunn Mons (at 46degrees south latitude, 214.5 degrees east longitude) inthe Imdr Regio area of Venus. The topographic backbone derives from data obtained by NASA's Magellan spacecraft, with a vertical exaggeration of 30 times. Radar data (in brown) from Magellan has been draped on top of the topographic data. Bright areas arerough or have steep slopes. Dark areas are smooth. The colored overlay shows the heat patterns derived from surface brightness data collected by the visible and infrared thermal imaging spectrometer, aboard the European Space Agency's Venus Express spacecraft. Temperature variations due to topography were removed. The brightness signals the composition of the minerals that have been changed due to lava flow. Red-orange is the warmest area and purple is the coolest. The warmest area is centered on the summit, which stands about 2.5 kilometers (1.6 miles) above the plains, and the bright flows that originate there. Idunn Mons has a diameter of about 200 kilometers (120 miles). The spectrometer data was collected from May 2006 to the end of 2007. A movie featuring 360-degree views of the volcano is based on the same data - http://www.esa.int/SPECIALS/Venus_Express/index.html Credit: NASA/JPL/ESA

The volcanic provinces, or hotspots, on which Smrekar and her team focused are geologically similar to Hawaii. Scientists previously detected plumes of hot rising material deep under Venus' surface. Those plumes are thought to have produced significant volcanic eruptions. Other data from the planet suggest that volatile gases commonly spewed from volcanoes were breaking down in its atmosphere. The rate of volcanism will help scientists determine how the interior of the planet works and how gases emitted during eruptions affect climate.

Something is smoothing Venus' surface because the planet has only about 1000 craters, a relatively small amount compared to other bodies in our solar system. Scientists think it may be the result of volcanic activity and want to know if it happens quickly or slowly. The Venus Express results suggest a gradual sequence of smaller volcanic eruptions as opposed to a cataclysmic volcanic episode that resurfaces the entire planet with lava.

Smrekar and her team also discovered that several volcanic features in the regions they studied show evidence of minerals found in recent lava flows. These mineral processes correspond to the youngest volcanic flows in each region, giving scientists additional support for the idea they formed during recent volcanic activity. On Earth, lava flows react rapidly with oxygen and other elements in the atmosphere when they erupt to the surface. On Venus, the process is similar, although it is more intense and changes the outer layer more substantially.

Scientists call Venus Earth's sister planet because of similarities in size, mass, density and volume. Scientists deduce that both planets shared a common origin, forming at the same time about 4.5 billion years ago. Venus also is the planet on which the runaway greenhouse effect was discovered. The planet is cloaked in a much less friendly atmosphere than Earth. It is composed chiefly of carbon dioxide, which generates a surface temperature hot enough to melt lead and a surface pressure 90 times greater than that on Earth. The small group of worlds in our solar system known to be volcanically active today includes Earth and Jupiter's moon Io. Crater counts on Mars also have suggested recent lava flows. Scientists are studying evidence of another kind of active volcanism that involves ice-spewing volcanoes on other moons in our solar system. Spacecraft data images: http://www.nasa.gov/topics/solarsystem/features/magellan20100408.html

FROM THE EDITOR'S TERMINAL

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

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

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

In April's StarGazer:

The next EAS Meeting is 3:00 pm, Saturday April 10th at the Evergreen Branch Library.