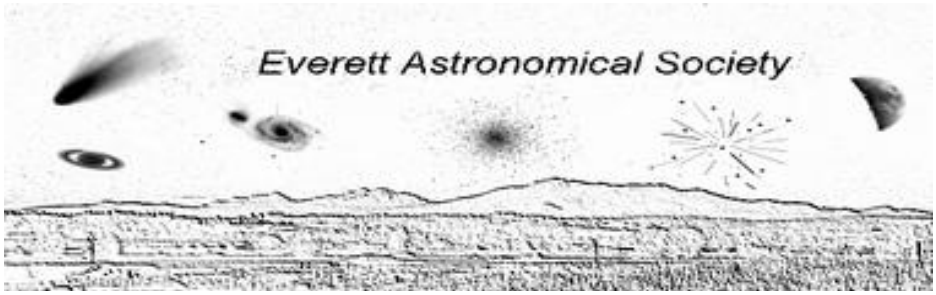
Volume MMX No. 3



The Stargazer

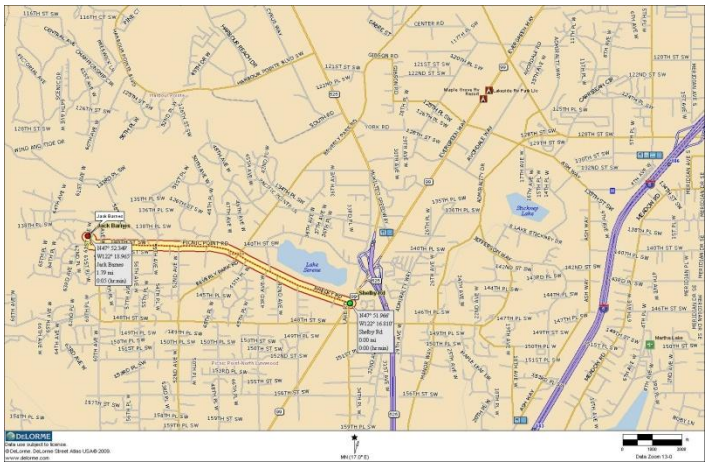
March 2010

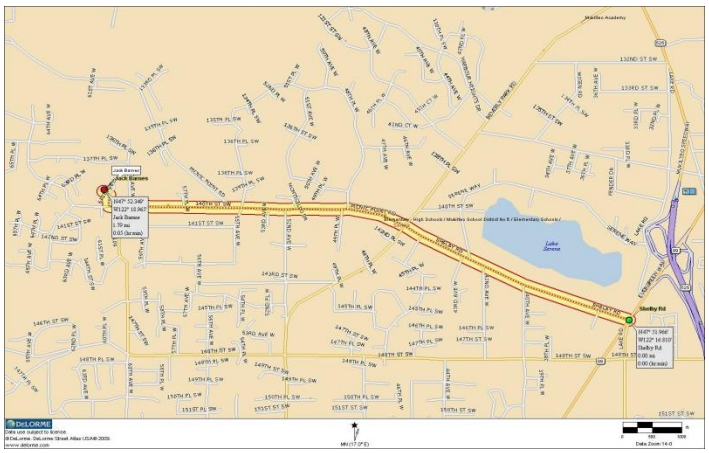
President:	Mark Folkerts	(425) 486-9733	folkerts at seanet.com	***The Stargazer***
Vice President:	<open>		--	**P.O. Box 12746**
Librarian:	Chris Dennis		--	**Everett, WA 98206**
Treasurer:	Jerry Galt		jerryg at genwest.com	
Newsletter co-editor:	<open>		--	
Web assistance:	Cody Gibson		cgibson41 at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

EAS BUSINESS…

EAS MEETING - SATURDAY MARCH 20TH - 7:00 PM, OBSERVATORY TOUR AT JACK & JUNE BARNES

6111 139th PL SW, Edmonds, WA 98026 -- 425-743-1766





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.

Mar 12 Apr 9 May 14 Jun 11 Jul 9 Aug 6 Sep 10
Oct 8 Nov 5 Dec 3

First star party of season successfully held February 20th ! EAS member Ron Tam has offered a flexible opportunity to EAS members to come to his home north of Snohomish for observing on clear weekend evenings and for EAS starparties. Anyone wishing to do so needs to contact him in advance and confirm available dates, and let him know if plans change**.** **"***Our place is open for star parties any Saturday except weekends of the Full Moon. People can call to get weather conditions or to confirm that there is a star party. Our phone number is (360) 568-5152. They can e-mail me too (tam1951@verizon.net) but I don't check my email daily. They can email me for directions if they never have been out here."* Listed below are proposed dates for **planned EAS star parties** at my [Ron Tam's] place, depending upon the weather, of course. Call Ron about spur-of-the-moment observing.

Please also join the EAS mail list, **and 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

MARCH -

Mar 20 – International Sidewalk Astronomy Night (ISAN) - http://www.sidewalkastronomers.us/id220.html

Mar 27 - OMSI-RCA Vernal Equinox Star Party, Rooster Rock State Park & Stub Stewart State Park, OR http://www.rca-omsi.org/sp/sp_schedule.htm http://www.rca-omsi.org/sp/r_rock.htm

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, or 23 & 24 (tba) – EAS Astronomy Day Star Party

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

Nov tba - Night Under the Stars, Alamo Lake, AZ - http://azstateparks.com/Parks/ALLA/events.html

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

2010 ASTRO CALENDAR

March 2010

Mar 14 - Daylight Savings - Set Clock Ahead 1 Hour (United States)
Mar 12-14 - RCA Messier Marathon Star Party, Kah-Nee-Ta Resort, OR
Mar 12-14 - RCA Maupin Dark Sky Star Party, Maupin, OR
Mar 20 - Vernal Equinox, 17:32 UT - Sun crosses equator, headed north
Mar 20 – EAS Meeting 7:00 pm - Open House at Jack Barnes Observatory
Mar 21 - Saturn at Opposition

April 2010

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

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 tba – EAS Meeting - location tba
May 16 - Moon Occults Venus
May 26 - Mercury At Its Greatest Western Elongation (25 Degrees)

June 2010

Jun 11 - Asteroid 1 Ceres Occults TYC 6845-00708-1 (11.6 Mag Star)
Jun 12 - New Moon .
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 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 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 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

Mar 23	First Quarter Moon
Mar 30	Full Moon
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

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

Object	*Rises*	*Sets*	*Con*	*Diam.*	*Mag*
Sun	***07:12 am***	***19:22***	***Psc***	***30'***	***-27.5***
Mercury	**7:29 am**	**19:54**	**Psc**	**5"**	**-1.6**
Venus	**7:51 am**	**20:48**	**Psc**	**10"**	**-3.9**
Mars	**13:36**	**05:29 am**	**Can**	**10"**	**-0.1**
Jupiter	**06:49 am**	**17:53**	**Aqr**	**33"**	**-2.0**
Saturn	**19:13**	**07:38 am**	**Vir**	**19"**	**+0.5**
Uranus	**07:12 am**	**19:00**	**Psc**	**03"**	**+5.9**
Neptune	**06:10 am**	**16:21**	**Cap**	**02"**	**+8.0**
Pluto	**03:01 am**	**12:18**	**Sag**	*	**+14.1**

(*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 maintains a $750+ balance. We try to keep approximately a $500 balance to allow for contingencies. This month we paid International Dark Skies Association dues, and we have annual liability insurance bill to pay.

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 mid-March to early April)
- By John W Goerger

Last month I made a slight mistake and here is the correction; while writing about **LONGITUDE** I later used the term "latitude" where LONGITUDE should have been used. This is also in the BOARD OF LONGITUDE, which in my haste in tying I glossed over and did not catch the error(s). I hope the error did not cause you any problems in understanding of how and the importance of determining LONGITUDE was and is today. If you ever have any questions or comments feel free to email me at pos1@earthlink.net. Latitude is how many degrees you are **"NORTH" or "SOUTH"** of the Earth's Equator", If you are north of the equator then just measure, in degrees of **ALTITUDE**, the latitude position you are, looking due north and you will find the "NORTH STAR" we call **POLARIS**.

Well finally, the season **SPRING** is here for the **NORTHERN HEMISPHERE** of the Earth (**FALL**, for those living in the **SOUTHERN HEMISPHERE** of our planet), but those of us living in the Pacific Northwest we are still having to deal with those stupid gray rainclouds and overcast at present. Also, we all have to put up with **DAYLIGHT SAVINGS TIME**! What a **PAIN**! I think, and email me if I am incorrect, but **ARIZONA** is the only state that *does not switch* between Standard and Daylight Savings Time. Arizona remains **STANDARD TIME** for its location so those folks don't have to keep running around and changing the settings of their clocks! For the rest of us that go to daylight savings, it means that it takes another additional hour before the sun, sets and then we have to wait until it is dark enough to do some deep sky observing with one's telescope(s). Because of the **TILT** of our planet, the **NORTH POLAR AXIS** is slowly aiming at the sun, so by June 21st, 22nd (First Day of Summer), the North Pole is bathed in sunlight 24 hrs a day.

★★★

As most of you know I like hanging around our local telescope store, **AURORA-ASTRO PRODUCTS** which is owned and operated by our good stargazing buddy, **James Bielaga**, and is located in the Silver Lake Plaza Center off of 19th Ave SE/Bothell Everett Highway, Highway 527, in Everett. Recently, I met two of Jim's customers who were each purchasing a telescope and related hardware for themselves. As we were chatting, a few points about stargazing came up which I have come across before. Most folks have forgotten, or in some cases, were not taught some of the basics of; I suppose you would say, goes under the heading of EARTH SCIENCE; that of the earths' orbit, its tilt and relationship to the other planets and their orbit about our star.

To begin with, the seasons we experience on Earth are not caused by the distance the earth is from the sun, but rather the tilt the earth has with respect to its orbit around the sun. The **ORBITAL PLANE** of the Earth around the sun is **ZERO DEGREES** and many of the other planets orbits are close to that plane or otherwise known as the **ECLIPTIC**. Except for the planet Pluto - (yes I am one of many who thinks Pluto needs to be reclassified back as a **PLANET**) - all the planets orbiting about the sun, lie close to the plane as the earth does. With Pluto, its orbital tilt is around 17-18 degrees from the rest of the planets in our solar system.

As stated above, the Earth is titled with respect to its orbit (*orbital plane/ecliptic*) which is around 23.5 degrees. It is this *tilt* that causes the seasons on earth, not the distance from our home star. The earths' equator runs east to west, with either pole being 90 degrees from the equator (you measure your distance north or south from it). The equator is where you start measuring latitude position (which is ZERO DEGREES LATITUDE); but the question is how do you determine whether you are North or South of the Earths' equator? If you are South of it, there will always be a minus (-) sign to the left of the degree number. However, North of the equator, that degree number is considered a "positive" (+) number so normally you would not use the positive symbol. Extending the earths' equator into space it becomes the **CELESTIAL EQUATOR** which is mentioned later in this article.

Earth is not the only planet that has a tilt with respect to the ecliptic; in fact **Uranus** tilt is so extreme that its tilt lies 90 degrees to its equator! *Uranus is laying over* in its orbit about the sun and for about 42 earth-yrs one pole of Uranus is bathed in sunlight while the other is in total darkness. As it slowly orbits about the sun, eventually the other pole of Uranus will receive starlight from the sun and the one that had received the faint sunshine from the sun, 42 yrs ago, will now experience total nightfall---for 42 earth-yrs. Mars is close to the same tilt as the Earth does, however its seasons are almost twice as long as we experience on Earth. "HEY, that means summer is twice as long! WAY COOL! Almost 6 months of SUMMER----AWESOME!" WAIT! Before you jump for joy and think this is a really neat place to "HANG", there is a downside; it means SCHOOL is twice as long too! "BUMMER, DUDE." Another thing about the tilt of Mars; its moons cannot keep it in that angular position and over time Mars will wobble very noticeably, unlike the Earth. Because of our moon, it keeps the tilt of our planet pretty much in check and stable for us inhabitants of earth.

I know, I know this is kind of **B-O-R-I-N-G!** At least it isn't as bad as going to the dentist for a root canal ("you want to bet on that?"). If the earth did not have a tilt, life on this planet would be **B-O-R-I-N-G!** For it is because of the tilt we get our **SEASONS**! This coming March 20th the sun will rise in the East and set in the West, and there will be

close to 12 hours of daylight and 12 hours of night on that date! Now comes a little math and do not get scared as it will be alright, just a little subtraction is all ("well I guess that is ok"). If you know your Latitude position of Earth that will help you find the star **POLARIS**, but this is for those living North of the Earths' Equator. It turns out the earths' North Pole happens to be aimed at a 3rd (apparent) magnitude star which among the nighttime stars is around the 52nd, brightest star in the evening sky. Polaris is not the brightest star in the evening sky, and if you thought so and were able to see Venus, which is the brightest of all the celestial objects except for the moon or the sun, and figured it was Polaris and started walking in that direction to go north, well the only thing that would happen to you is you would end up walking into the Pacific Ocean, which I don't think you had intended!

To find **NORTH,** orient yourself: The sun, planets and the moon all rise in the East, so have your right shoulder toward the East and your left shoulder toward where the sun, moon and planets set, which is west. This means your head and face are now looking North. Here is the key; if you know your Latitude from the earths' equator, just measure that many degrees in **ALTITDUE**, up looking due north. For those of us living in the Everett WA area our Lat. position is around 47 degrees north of the equator. So, look up 47 degrees in altitude and there will be Polaris, the last star in the tail of the small bear (**LITTLE DIPPER**). Also, if it clear (and there aren't any stupid clouds around) locate the unofficial constellation (a grouping or gathering of stars) the **BIG DIPPER** (The Large Bear). When you locate it, it looks like a ladle or a "Dipper". As if you were pouring something out of the ladle find the last two stars that make up the ladle; the one at the end and the other star that makes up the bottom, and using them as "pointing stars" they will point you to the star Polaris!

In describing the above, I mentioned where to look to find the sun, moon and planets rising and setting; well if you notice from night to night those objects do not seem to vary much from a line going from East to West. That **"LINE**" is the ECLIPTIC or the earths' orbital plane around our sun. With Pluto it varies only around 17-18 degrees from that line as well. Now to have a bit of fun! Well from an astronomer's point-of-view, it is! Take the number 90, which is the angle the Equator is from either pole of the earth. Since I am writing about the latitude of Everett WA of 47 degrees North, which is the other number we need. Now SUBTRACT 90 from 47 and what do you get? Yep, you are CORRECT---**43 DEGREES**! Now, let us say you are facing due North, turn round 180 degrees and look south and measuring from the southern horizon, look up 43 degrees. You know what you are looking at? Yes you are looking into the night sky but something else; the **CELESTIAL EQUATOR**! "Huh?" You might ask. Well, take the Earths' Equator and extend it into space, this making it become the Celestial Equator. As with the earths' equator which divides the earth between the Northern and Southern Hemispheres, the celestial equator does the same thing for the sky; dividing it into the Northern Celestial Hemisphere and the Southern Celestial Hemisphere!

You might think to yourself, so what is the big deal about knowing where the Celestial Equator is? Well if you are in charge of building a super massive telescope to study the **UNIVERSE**, which means being able to study as much of the sky as one can, you want to place the **OBSERVATORY** somewhere on Earth so you can observe as much of the sky as possible. Check out the leading locations of the worlds' major Observatories and you will find that most of them are near 33 degrees North or South of the Earths' Equator. The closer you are to the equator the more objects these observatories can examine and study. There are lots of numbers tossed around as to the TOTAL NUMBER OF STARS a person can see on a given night, for their location (given that there aren't any idiot rain clouds or overcast around) without optical aid. The astronomy instructor I had, had as his Thesis Advisor in the 1970s' was a Dr. Abell from UCLA. My instructor was a Dr. Thomas Stephen Eastmond, at Santa Ana College In the city of Santa Ana CA., (who is still there, and Director of Orange County California's largest planetarium, **TESSMANN PLANETARIUM**) and this is what he told all his classes:

"On a given night, in a dark environment with no lights, away from the city, a person with normal 20/20 vision, (what is called Naked Eye Vision) would see around 1100 stars over the entire night (from sunset to sunrise). At the equator that same person would see, over the course of one earth year, and the same given set of conditions, close to 6,000 objects!"

Now you have an understanding why they don't build major optical and radio observatories in Missoula Montana, Rugby North Dakota or up in Alaska or in the Antarctic. There might be a specific reason to set-up a type of research in those locals, but for general purpose deep-sky work, all observatories are as close to the equatorial position as possible; at least at the present. However, as we know there is a much neater place to have observatories; in space itself! **HUBBLE** and the other Great Space-Based Telescopes and others that are in the works! There are of course a few astronomers who are not totally thrilled with space-based telescopes. I remember meeting a couple of them from the **U of San Diego** in late 1983, who thought the money being set aside for **HUBBLE** should be used to build more ground-based 'scopes. People are entitled to their opinion but when it impacts upon sciences ability to study nature then logic and reason must dictate how science is to proceed, not personal feelings. Think what our understanding and knowledge of the oceans would be if that same thinking had been applied to whether or not submarines should be built and used. Could you image someone saying something of the following, say 100 yrs ago: "We can study the oceans just fine from surface ships; lower some instruments into the ocean and we can learn all we need about the make-up, composition of the oceans and its inhabitants and geology".

For many hobbyists in astronomy a growing trend is the **DOBSOIAN** type of 'scope. They are a Reflector-type 'scope, generally non-motor driven and are a very easy and worthwhile instrument to use. They are generally inexpensive, as the size of the mirror can be substantial for relative low cost, compared to the Newtonian German-Equator/Polar Aligned telescopes. The ability of the 'scope to remain pointing at an celestial object without the tube of the scope dropping downward is because of the spring-tension-system which is an example of higher quality instruments. **ORION**, **MEADE** and other makers of astronomical equipments have these telescopes ready for your use. However, what makes the Dobsonian so popular is the simple ability that a person can assemble one rather than purchasing a completed scope! Of course, either way you go, purchasing an already completed Dobsonian or you assembling your own 'scope; just visit your friendly local astronomy hobby store and you will be ready to "rock 'n roll" into the cosmos with your "**LIGHTBUCKET**"!

For those that have a Dobsonian you all know what I am writing about and of course with any item you own there are always advantages and disadvantages. Dobsonian "drives" are manual in that as the earth rotates from west to east the object(s) you are observing will drift out of your field of view, moving from east to west. Using a low power eyepiece will keep the object in view a bit longer but will move out of view of your eyepiece within a few minutes. When you increase the magnification by changing to a different eyepiece of higher power, the object you are magnifying will appear to move faster and will be out of your field-of-view quicker. There are plans that have been written in the astronomy magazines about constructing a motor-drive for your

'scope and I suspect you could check the 'net for those instructions as well.

For those that have Dobsonian Telescopes and other type of 'scopes it is important to understand where the celestial equator (the earths' equator, extended into space and the tilt of our planet) and how to find its location for your specific latitude on earth. As stated before, knowing your latitude tells how you how many degrees north or south you are from the equator. With the celestial equator, it is your reference as to whether the object you want to aim your telescope at is in the northern region or the southern part of the sky, in degrees. A **DEGREE**, by the way, is an angle in the sky; the **FULL MOON** as high as it can get in the sky for your specific location **takes up ½ of a degree in the sky** as does the sun! So, **ONE DEGREE** would be TWO FULL MOON or TWO FULL SUN DIAMETERS! Star-charts and books with the location of items in the sky will have two numbers for the location of any object you choose to observe. The **DECLINATION (DEC) NUMBER** is the number in degrees of a celestial target, is from the celestial equator. For observers in Everett WA, as mentioned earlier, looking due south is the celestial equator at an altitude of 43 degrees above the southern horizon; objects 0 degrees in dec to a -30 dec, going from the celestial equator and dropping in altitude toward the south are within your coverage of the southern night sky to and observer. If your star-chart shows some object with a dec of -40, -50, -75; this tells you the object is so far south, in the southern hemisphere sky and is below the southern horizon; from your northern latitude position, and would not be visible from your location. On the other hand, you have available to you all the celestial objects within the northern celestial region, based on your telescope(s) resolving capabilities!

The other number listed is the object(s) (**RIGHT ASCENSION** (**RA**) which is the longitude in space of that object. These lines run north to south but measure directions West and East. In astronomy the RA is divided into 15 degree regions and if you think about it, it makes sense. How long does it take the earth, spinning on its axis to rotate one complete cycle? If your answer is 24, that is correct because in 24 hours the earth rotates its entire circumference, and the earth is 360 degrees round. So, take 360 and divide it by 24 and you get 15! With longitude the starting point is Greenwich England but that would not work for astronomy; the starting point for RA is the **FIRST DAY OF SPRING** (of the northern hemisphere)! The number 15 are 15 degree angles per hour and starts Westward, from 0 Hr RA counting "WEST" (LEFT) facing South, the First 15 degrees would be 01HR RA, then the next is 02HR RA and so forth. When you get to 23 HR RA the next number would be "0" again since 24 and 0 are the same number. Knowing the RA of some celestial object is needed because sometime the object you might be searching for could be in the daytime sky and knowing its DEC is needed because that is the second point of reference and might plot that object way in the southern part of the sky, where from your northern position on earth would be below your southern horizon.

It is at this First Day of Spring or otherwise called the **SPRING EQUIONOX** (meaning equal days and nights as stated previously) which the earths' orbital path (the ecliptic) intersects with the celestial equator (remember the earth has a 23.5 degree tilt with respect to the plane of its orbit). If you were to watch the rising and setting of the sun, say, 2-3 times a week, during and just after the Spring Equinox, you would notice the sun is slowly rising further and further **NORTHWARD** along the **EASTERN HORIZON**! Additionally, the sun, over in the west would be moving along the western horizon NORTHWARD, during sunset. Furthermore, the time the sun is rising would be getting earlier and earlier with the sun setting later and later over in the western horizon. As stated earlier, the sun would, looking south, be higher in the sky for your latitude! Because of all of this and DAYLIGHT SAVINGS TIME the time it takes for the sky to get dark is very short and for those living in the Pacific Northwest there is even a period during summer where there is only two to three hours of darkness, then it gets "light" again!

Further north, one does not even get darkness but a deep twilight and long the Arctic Circle, total daylight with the sun apparently just moving around and just above the entire horizon! As mentioned, the sun at this point in the earths' orbit (SPRING), both poles of the earth would be experiencing twilight but as the earth continued to orbit the sun, the sun would be seen higher in the northern latitudes and lower in the southern ones. From then, on as the earth orbits about the sun, the sun will appear to get higher and higher northward in the sky, until June 21st/22nd when looking due south at noon, the sun will be at its highest position in our daytime sky, but it will not be directly "overhead". At this time, the North Pole is now aimed at the sun and there, at the North Pole, the sun would shine 24/7! At the South Pole it would be total darkness, 24/7. By June 21st/22nd, (**SUMMER SOLISTICE**—NORTHERN HEMISPHERE) the sun will seem to rise and set at the same location for about 2-3 days. If you check the angle from where the sun was rising on the First Day of Spring to where it is rising on the First Day of Summer you would find an angle of---23.5 degrees, the same is true if you measured the angle the sun had when it was setting in the west on the First day of Spring to when it was setting over in the western horizon, on the First Day of Summer---23.5 degrees.

With the launch of the Space Shuttle Discovery slated for April 5th, of this year, means there are only three more manned flights of the space shuttle system; than the US Government will shut-down US manned launch flights from the United States of America. Once that happens, the **U.S. ASTRONAUT CORPS** will have to depend on Foreign Countries for rides aboard space vehicles into space and to the ISS. This mission of the space shuttle known as **STS-131**, according to NASA;"will carry a Multi-Purpose Logistics Module filled with science racks that will be transferred to laboratories of the ISS". With President's Obama's cutting the U.S. ability to launch human beings into space (see last months' article) and the cancellation of America's Manned Return to the Moon many in Congress are putting up roadblocks demanding answers to the White Houses' short-sighted seeing of pushing for new orbital earth-resources satellites and a few more robotic space probes to the planets. Space, is the next Physical and Economic Frontier for the United States of America and the rest of the planet! There are some near-by asteroids (NEO's-Near Earth Objects) that are worth **TRILLIONS OF U.S. DOLLARS** (asteroids composition), as well as the material that makes up the moon; and just as the Western United States was developed after the American Civil War, with the help of Investment of Billions of Dollars by the Government (Transcontinental Railroad), the Solar System offers unlimited wealth and prosperity for those cultures on Earth willingly to invest into it!

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More on this stuff in my next column but now a "few" words on your celestial friends we all want to stare at with our telescopes which have probably been packed since we got them for a Christmas present, Birthday Present or been packed since Fall because of the really stupid clouds we have had to put up with in the Pacific Northwest! For some who have a solar scope or a filter that you can place over the front of your observing instrument one can now start and see what activity is going on the sun. Reports are coming in that the sun might just start becoming active again with the presence of **SUNSPOTS** and **PROMANIANCES**! If any have had the chance of observing the sun with the equipment necessary to observe the sun, it is a real treat as one who has, will tell you!

Venus is still low in the west but shinning like a **LIGHTHOUSE BEACON** at a visual -3.9! Toward the end of March it will be about 12 degrees high about 30 minutes after sunset, and will remain visible for an hour after that! Its present angular diameter is about 10 arc seconds (10"). The amount of Venus that is being lit by the sun has dropped a bit, from 98% to 95%, which actually isn't much. Venus is visited by our lovely companion through the cosmos, the moon. The 20th of March (the day of the Everett Astronomy Society meeting); a thin crescent waxing moon crosses the southern part of the **PLEIADES (M45)** star cluster. Observing though binoculars or a telescope you will see some of the stars of Pleiades being "eclipsed" by the moon!

Mercury is putting on a good show and toward the last week of March you should catch a glimpse of this **Roadrunner of our solar system**! Around the 22nd, 20 minutes after the sun has set, Mercury is about 3 degrees above the horizon and 9 degrees below Venus twinkling at an apparent -1.0 with a diameter of 6.1 arc seconds (6.1") and about 74% of it illuminated by the sun, on the 31st. At this date it is about 3 degrees from Venus and is 10 degrees high, 30 minutes after sunset. It will remain visible until 8:30 PM local, DST (Daylight Savings Time). By the 1st of April (and no this is not an April Fool Joke) the constellation Orion will be somewhat toward the western horizon with Venus between Orion and the horizon. **Mercury** than will be at an apparent 1.2visual, near Venus by about 3 degrees. By the 8th, Mercury's orbit will start to take it back toward the sun's direction, Something else Mercury will be doing during the first two weeks of April but you will have to wait until next month's column!

Mars is decreasing in size, fast! Toward the end of March its angular diameter will be around 9 arc seconds (9") at a visual apparent 0.4 by April 15th. It was a -0.2 on March 15th, so you can see its brightness is dropping off as well. Its location in early April is in the southwest, fairly high; in the evening sky as this might be the last chance to get a fair view of the planet and its features with a moderate size telescope.

Saturn, which had an apparent visual brightness of 0.5 on the 15th of March, reaches **OPPOSITON** (it is "opposite" the sun); as the sun sets, Saturn rises by the 21st of March 2010.This, is also the time in its orbit about the sun that it lies at its "closest" to our planet. Including its ring structure, it spans 44 arc seconds across (44"). Last year the rings were "edge-on" and now they are tilted 3 degrees to our line-of-sight. Additionally, we are now seeing the northern face of the rings after 15 years. Because there is a difference between the orbital inclinations of Earth and Saturn, this 3 degree tilt will start to close up, temporary to 2 degrees, from mid-April to July 2010. By the end of 2010 the rings will once again open up to about a 10 degree tilt. As you observe Saturn make sure you check out her moons; **TITAN**, visual apparent 8 with **TETHYS**, **DIONE**, **RHEA,** all shinning at around a visual 10th (these are within the range of most scopes), and **IAPETUS** at a 12th apparent magnitude. **Jupiter** rises on the 1st of April but will be in a darker, easier to observe object at the end of April. By the 15th of the month it shines at a -2.0 and more on Jupiter in next month's column. ***The Planetarium!***

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One more mention of your local telescope/astronomy store. Remember if you are buying a telescope, binoculars, or some other major piece of astronomy equipment, even a fairly pricey eyepiece and decide instead not to order it from your local astronomy hobby store but order it from some 'net based telescope company, a general hobby store or a company which is not local, you might get something you were not expecting---BIG PROBLEMS! If you have problems with the item you purchased who, are you going to take it to, to help you with the problem(s)? Or, what if you do not understand how the product works, who are you going to go to for help, Your local astronomy store? I do not think so!

How would you feel if you had a business and had a customer coming to you, asking you tons of questions about a product or products you are carrying, then they go to another company, perhaps outside the State, and order those items from them; they get the product(s) but now bring it to you to help them understand the use of it or the problem(s) they are having with the product. You would tell them to take the product to the company they purchased it from, wouldn't you? We are all under quite a bit of pressure because of the economy and it is understandable to try and save, if possible a few bucks. However, in the long run it is prudent to go with those people who are willingly to give you their time and knowledge in assisting you with the product you are seeking. Because if there is a problem they are there to help you handle the situation as quickly and efficiently as possible, and in the long run it usually is cheaper both in money and your time. **AD ASTRA! KEEP LOOKING UP!**

– *John Goerger*

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

RADAR FINDS ICE DEPOSITS AT MOON'S NORTH POLE; ADDITIONAL EVIDENCE OF WATER ACTIVITY ON MOON

Using data from a radar that flew aboard India's Chandrayaan-1 spacecraft, scientists have detected ice deposits near the moon's north pole. The Mini-SAR instrument, a lightweight, synthetic aperture radar, found more than 40 small craters with water ice. The craters range in size from 1 to 9 miles (2 to15 km) in diameter. Although the total amount of ice depends on its thickness in each crater, it's estimated there could be at least 1.3 million pounds (600 million metric tons) of water ice.

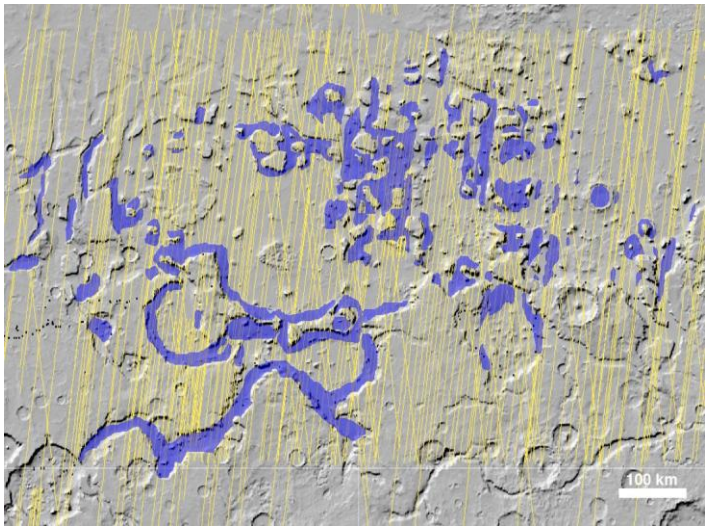
"*The emerging picture from the multiple measurements and resulting data of the instruments on lunar missions indicates that water creation, migration, deposition and retention are occurring on the moon*," said Paul Spudis, principal investigator of the Mini-SAR experiment. "*The new discoveries show the moon is an even more interesting and attractive scientific, exploration and operational destination than people had previously thought*." During the past year, the Mini-SAR mapped the moon's permanently-shadowed polar craters that aren't visible from Earth.

The radar uses the polarization properties of reflected radio waves to characterize surface properties. Results from the mapping showed deposits having radar characteristics similar to ice. "*After analyzing the data, our science team determined a strong indication of water ice, a finding which will give future missions a new target to further explore and exploit*," said Jason Crusan. The results are consistent with recent findings of other instruments and add to the growing scientific understanding of the multiple forms of water found on the moon. The Moon Mineralogy Mapper discovered water molecules in the moon's polar regions, while water vapor was detected by Lunar Crater Observation and Sensing Satellite, or LCROSS. Mini-SAR and Moon Mineralogy Mapper are two of 11 instruments on the Indian Space Research Organization's Chandrayaan-1. For more info about Mini-SAR, also known as Mini-RF, http://www.nasa.gov/mini-rf

RADAR MAP OF BURIED MARTIAN ICE ADDS TO CLIMATE RECORD

Extensive radar mapping of the middle-latitude region of northern Mars shows that thick masses of buried ice are quite common beneath

protective coverings of rubble. The ability of Mars Reconnaissance Orbiter to continue charting the locations of these hidden glaciers and ice-filled valleys -- first confirmed by radar two years ago -- adds clues about how these deposits may have been left as remnants when regional ice sheets retreated.

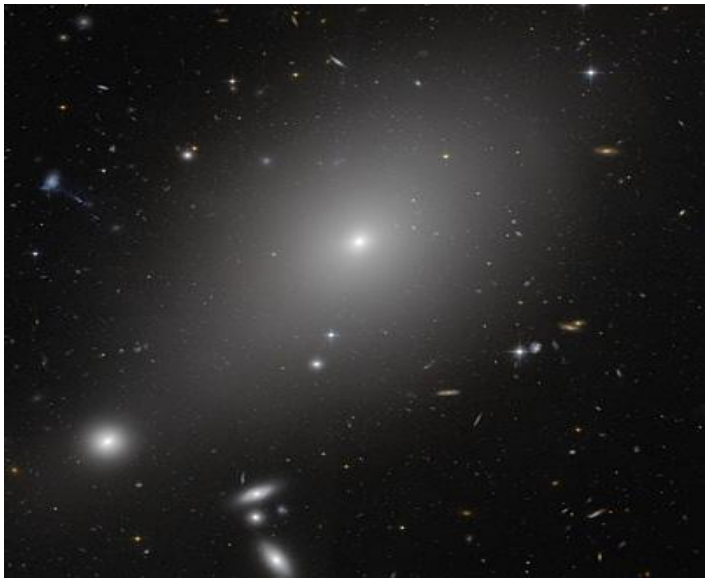


The Shallow Radar instrument on NASA's Mars Reconnaissance Orbiter has detected widespread deposits of glacial ice in the mid-latitudes of Mars. This map of a region known as Deuteronilus Mensae, in the northern hemisphere, shows locations of the detected ice deposits in blue. The yellow lines indicate ground tracks of the radar observations from multiple orbits of the spacecraft. The ice, up to 1 kilometer (0.6 mile) thick, is found adjacent to steep cliffs and hillsides, where rocky debris from slopes covers and protects the ice from sublimation into the atmosphere. The base map of this image is shaded relief topography obtained by the Mars Orbiter Laser Altimeter on NASA's Mars Global Surveyor. The image is centered at 42.2 degrees north latitude and 24.7 degrees east longitude. It covers an area 1050 kilometers by 775 kilometers (650 miles by 481 miles). Image Credit: NASA/JPL-Caltech/ASI/University of Rome/Southwest Research Institute

The subsurface ice deposits extend for hundreds of kilometers, or miles, in the rugged region called Deuteronilus Mensae, about halfway from the equator to the Martian north pole. Jeffrey Plaut and colleagues prepared a map of the region's confirmed ice. The Shallow Radar instrument on the orbiter has obtained more than 250 observations of the study area, which is about the size of California. "*We have mapped the whole area with a high density of coverage*," Plaut said. "*These are not isolated features. In this area, the radar is detecting thick subsurface ice in many locations*." The common locations are around the bases of mesas and scarps, and confined within valleys or craters. Plaut said, "*The hypothesis is the whole area was covered with an ice sheet during a different climate period, and when the climate dried out, these deposits remained only where they had been covered by a layer of debris protecting the ice from the atmosphere*." The researchers plan to continue the mapping. These buried masses of ice are a significant fraction of the known non-polar ice on Mars. The ice could contain a record of environmental conditions at the time of its deposition and flow, making the ice masses an intriguing possible target for a future mission with digging capability.

BULLY GALAXY RULES THE NEIGHBORHOOD

In general, galaxies can be thought of as sociable, hanging out in groups and frequently interacting. However, this recent Hubble Space Telescope image highlights how some galaxies appear to be hungry loners. These cosmic oddities have set astronomers onto 'the case of the missing neighboring galaxies'. Located half a billion light-years from Earth, ESO 306-17 is a large, bright elliptical galaxy in the southern sky of a type known as a fossil group. Astronomers use this term to emphasize the isolated nature of these galaxies. However, are they like fossils – the last remnants of a once-active community – or is it more sinister than that? Did ESO 306-17 gobble up its next-door neighbors? Gravity brings galaxies together and bigger ones swallow smaller ones. There is evidence that our own Milky Way galaxy has 'snacked' on numerous smaller galaxies that strayed too close. ESO 306-17 and other fossil groups may be the most extreme examples of galaxy cannibalism, ravenous systems that don't stop until they've devoured all of their neighbors.



The giant elliptical galaxy ESO 306-17

In this image, taken by Hubble's Advanced Camera for Surveys, it appears that ESO 306-17 is surrounded by other galaxies, but the bright galaxies at bottom left are probably in the foreground, not at the same distance in the sky. In reality, ESO 306-17 lies fairly abandoned in an enormous sea of hot gas according to studies conducted by both XMM-Newton mission and Chandra X-ray Observatory. It is also thought to be surrounded by an even larger amount of mysterious dark matter, although no one has directly detected this yet.

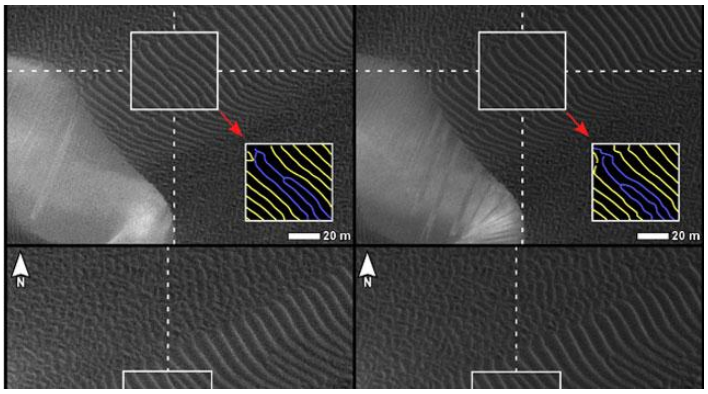
When zooming in closely on ESO 306-17, faint clusters of stars can be seen through the bright shine of the galaxy's large halo. These are globular clusters: tightly bound groups of stars that can often fend off cannibalism from larger, bullying galaxies. Studying these surrounding clusters will prove helpful to astronomers in their pursuit to put the pieces of ESO 306-17's history together. Researchers are also using this image to search for nearby ultra-compact dwarf galaxies. These are mini versions of dwarf galaxies that have been left with only their core after interaction with larger, more powerful galaxies. Most ultra-compact dwarfs discovered to date are near giant elliptical galaxies in large clusters of galaxies, so it will be interesting to see if researchers find similar objects in fossil groups.

MARS DUNES: ON THE MOVE?

New studies of ripples and dunes shaped by the winds on Mars testify to variability on that planet, identifying at least one place where ripples are actively migrating and another where the ripples have been stationary for 100,000 years or more. Patterns of dunes and the smaller ripples present some of the more visually striking landforms photographed by cameras orbiting Mars. Investigations of whether they are moving go back more than a decade.

Two reports presented at the 41st Lunar and Planetary Sciences Conference make it clear that the answer depends on where you look. Both reports used images from the High Resolution Imaging Science Experiment (HiRISE) camera on Mars Reconnaissance Orbiter, which allows examination of features as small as about a meter, or yard, across.

One report is by Simone Silvestro and his collaborators. They investigated migration of ripples and other features on dark dunes within the Nili Patera area of Mars' northern hemisphere. They compared an image taken on Oct. 13, 2007, with another of the same dunes taken on June 30, 2007. Most of the dunes in the study area are hundreds of meters long. Ripples form patterns on the surfaces of the dunes, with crests of roughly parallel ripples spaced a few meters apart.



Careful comparison of the images revealed places where ripples on the surface of the dunes had migrated about 2 meters (7 feet) -- the largest movement ever measured in a ripple or dune on Mars. The researchers also saw changes in the shape of dune edges and in streaks on the downwind faces of dunes. "*The dark dunes in this part of Mars are active in present-day atmospheric conditions*," Silvestro said. "*It is exciting to have such high-resolution images available for comparisons that show Mars as an active world*."

The other report is by Matthew Golombek and collaborators. They checked whether ripples have been moving in the southern-hemisphere area of Mars' Meridiani Planum where the Mars Exploration Rover Opportunity has been working since 2004. They used observations by Opportunity as well as by HiRISE, surveying an area of about 23 square kilometers (9 square miles). Examination of ripples at the edges of craters can show whether the ripples were in place before the crater was excavated or moved after the crater formed. "*HiRISE images are so good, you can tell if a crater is younger than the ripple migration*," Golombek said. "*There's enough of a range of crater ages that we can bracket the age of the most recent migration of the ripples in this area to more than 100,000 years and probably less than 300,000 years ago*."

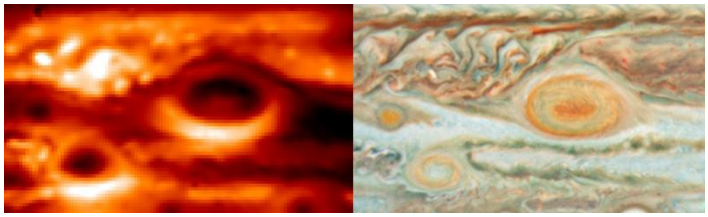
Winds are still blowing sand and dust at Meridiani. Opportunity has seen resulting changes in its own wheel tracks revisited several months after the tracks were first cut. Golombek has a hypothesis for why the ripples at Meridiani are static, despite winds, while those elsewhere on Mars may be actively moving. Opportunity has seen that the long ripples in the region are covered with erosion-resistant pebbles, nicknamed "blueberries," which the rover first observed weathering out of softer matrix rocks beside the landing site. These spherules -- mostly about 1 to 3 millimeters (0.04 to 0.12 inches) in diameter -- may be too large for the wind to budge. "*The blueberries appear to form an armoring layer that shields the smaller sand grains beneath them from the wind*," he said. HiRISE Principal Investigator Alfred McEwen said, "*The more we look at Mars at the level of detail we can now see, the more we appreciate how much the planet differs from one place to another*." http://www.jpl.nasa.gov/news/news.cfm?release=2010-076&cid=release_2010-076

SEE SPOT ON JUPITER. SEE SPOT GLOW (IN INFRA-RED)

New thermal images from powerful ground-based telescopes show swirls of warmer air and cooler regions never seen before within Jupiter's Great Red Spot. The observations reveal that the reddest color of the Great Red Spot corresponds to a warm core within the otherwise cold storm system, and images show dark lanes at the edge of the storm where gases are descending into the deeper regions of the planet. These types of data, detailed in a paper appearing in the journal Icarus, give scientists a sense of the circulation patterns within the solar system's best-known storm system. "*This is our first detailed look inside the biggest storm of the solar system*," said Glenn Orton, a senior research scientist, who was one of the authors of the paper. "*We once thought the Great Red Spot was a plain old oval without much structure, but these new results show that it is, in fact, extremely complicated*."

Sky gazers have been observing the Great Red Spot in one form or another for hundreds of years, with continuous observations of its current shape dating back to the 19th century. The spot, which is a cold region averaging about 110 Kelvin (minus 260 degrees Fahrenheit) is so wide about three Earths could fit inside its boundaries.

The thermal images obtained by giant 8-meter (26-foot) telescopes used for this study -- the European Southern Observatory's Very Large Telescope (VLT) in Chile, the Gemini Observatory telescope in Chile and the Subaru telescope in Hawaii -- have provided an unprecedented level of resolution and extended the coverage provided by Galileo spacecraft in the late 1990s. Together with observations of the deep cloud structure by the 3-meter (10-foot) Infrared Telescope Facility in Hawaii, the level of thermal detail observed from these giant observatories is comparable to visible-light images from Hubble Space Telescope for the first time. One of the most intriguing findings shows the most intense orange-red central part of the spot is about 3 to 4 Kelvin (5 to 7 degrees Fahrenheit) warmer than the environment around it, said Leigh Fletcher, the lead author of the paper, who completed much of the research as a postdoctoral fellow. This temperature differential might not seem like a lot, but it is enough to allow the storm circulation, usually counter-clockwise, to shift to a weak clockwise circulation in the very middle of the storm. Not only that, but on other parts of Jupiter, the temperature change is enough to alter wind velocities and affect cloud patterns in the belts and zones.



New thermal images from powerful ground-based telescopes show swirls of warmer air and cooler regions never seen before within Jupiter's Great Red Spot. The images enable scientists to make the first detailed weather map of the inside of the giant storm system. One observation illustrated by this image is the correspondence between a warm core within an otherwise cold storm system and the reddest color of the Great Red Spot. The image on the left was obtained by the European Southern Observatory's Very Large Telescope in Chile on May 18, 2008. It was taken in the infrared wavelength range of 10.8 microns, which is sensitive to Jupiter's atmospheric temperatures in the 300 to 600 millibars pressure range. That pressure range is close to the altitude of the white, red and brown aerosols seen in the visible-light image on the right, which was obtained by the Hubble Space Telescope on May 15, 2008. These images show the

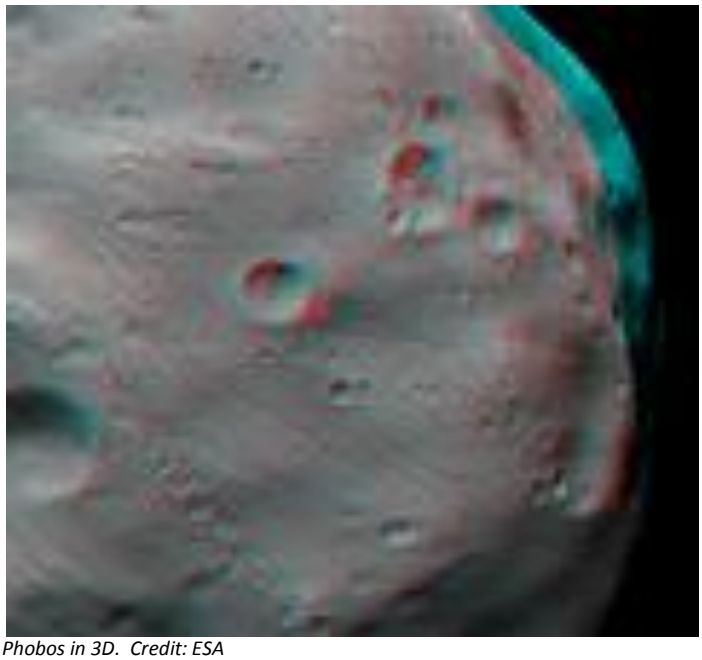
interaction of three of Jupiter's largest storms -- the Great Red Spot and two smaller storms nicknamed Oval BA and Little Red Spot. Credit: NASA/JPL/ESO and NASA/ESA/GSFC

"*This is the first time we can say that there's an intimate link between environmental conditions -- temperature, winds, pressure and composition - and the actual color of the Great Red Spot*," Fletcher said. "Although we can speculate, we still don't know for sure which chemicals or processes are causing that deep red color, but we do know now that it is related to changes in the environmental conditions right in the heart of the storm."

Unlocking the secrets of Jupiter's giant storm systems will be one of the targets for infrared spacecraft observations from future missions including the Juno mission.

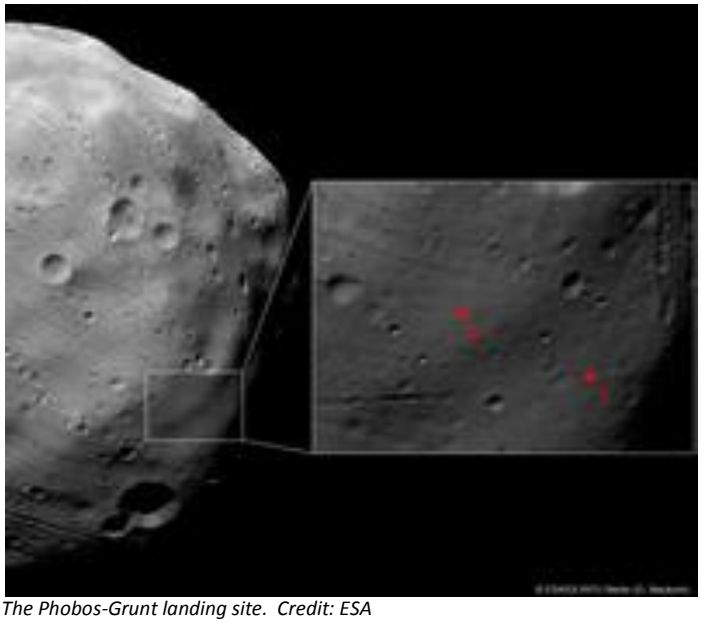
Phobos Flyby Images

Images from the recent flyby of Phobos, on 7 March show Mars' rocky moon in exquisite detail, with a resolution of just 4.4 meters per pixel. They show the proposed landing sites for the forthcoming Phobos-Grunt mission. Mars Express spacecraft orbits the Red Planet in a highly elliptical, polar orbit that brings it close to Phobos every five months. It is the only spacecraft currently in orbit around Mars whose orbit reaches far enough from the planet to provide a close-up view of Phobos. Like our Moon, Phobos always shows the same side to the planet, so it is only by flying outside the orbit that it becomes possible to observe the far side. Mars Express did just this on 7, 10 and 13 March 2010. Mars Express also collected data with other instruments.



Phobos in 3D. Credit: ESA

Phobos is an irregular body measuring some 27 × 22 × 19 km. Its origin is debated. It appears to share many surface characteristics with the class of 'carbonaceous C-type' asteroids, which suggests it might have been captured from this population. However, it is difficult to explain either the capture mechanism or the subsequent evolution of the orbit into the equatorial plane of Mars. An alternative hypothesis is that it formed around Mars, and is therefore a remnant from the planetary formation period. In 2011 Russia will send a mission called Phobos–Grunt (meaning Phobos Soil) to land on the Martian moon, collect a soil sample and return it to Earth for analysis. For operational and landing safety reasons, the proposed landing sites were selected on the far side of Phobos within the area 5°S-5°N, 230-235°E. This region was imaged by the HRSC high-resolution camera of Mars Express during the July-August 2008 flybys of Phobos.



The Phobos-Grunt landing site. Credit: ESA

But new HRSC images showing the vicinity of the landing area under different conditions, such as better illumination from the Sun, remain highly valuable for mission planners.

Mars moon Phobos - Credit: ESA

It is expected that Earth-based ESA stations will take part in controlling Phobos-Grunt, receiving telemetry and making trajectory measurements, including implementation of very long-baseline interferometry (VLBI). This cooperation is realized on the basis of the agreement on collaboration of the Russian Federal Space Agency and ESA in the framework of the Phobos-Grunt and ExoMars projects.

Phobos in 3D – Credit: ESA

Mars Express will continue to encounter Phobos until the end of March, when the moon will pass out of range. During the remaining flybys, HRSC and other instruments will continue to collect data

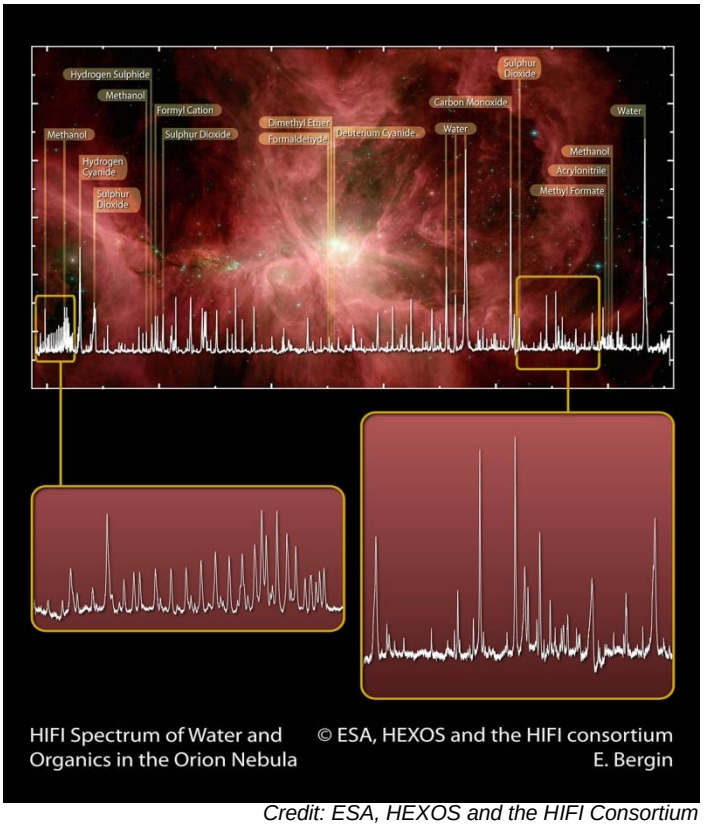
PRECURSORS OF LIFE-ENABLING MOLECULES IN ORION NEBULA

HIFI instrument finds Spectrum of Water and Organics in the Orion Nebula. The Herschel Space Observatory has revealed the chemical fingerprints of potential life-enabling organic molecules in the Orion Nebula, a nearby stellar nursery in our Milky Way galaxy.

This detailed-spectrum, obtained with the Heterodyne Instrument for the Far Infrared (HIFI) - one of Herschel's three innovative instruments - demonstrates the gold mine of information that Herschel-HIFI will provide on how organic molecules form in space.

The spectrum, one of the first to be obtained with HIFI since it returned to full health in January 2010 following technical difficulties, clearly demonstrates that the instrument is working well. Striking features in the HIFI spectrum include a rich, dense pattern of "spikes", each representing the emission of light from a specific molecule in the Orion Nebula. This nebula is known to be one of the most prolific chemical factories in space, although the full extent of its chemistry and the pathways for molecule formation are not well understood. By sifting through the pattern of spikes in this spectrum, astronomers have identified a few common molecules that appear everywhere in the spectrum. The identification of the many other emission lines is currently ongoing.

By clearly identifying the lines associated with the more common molecules, astronomers can then begin to tease out the signature of particularly interesting molecules that are the direct precursors to life-enabling molecules. A characteristic feature of the Orion spectrum is the spectral richness: among the molecules that can be identified in this spectrum are water, carbon monoxide, formaldehyde, methanol, dimethyl ether, hydrogen cyanide, sulfur oxide, sulfur dioxide and their isotope analogues.



Credit: ESA, HEXOS and the HIFI Consortium

It is expected that new organic molecules will also be identified. "*This HIFI spectrum, and the many more to come, will provide a virtual treasure trove of information regarding the overall chemical inventory and on how organics form in a region of active star formation. It harbors the promise of a deep understanding of the chemistry of space once we have the full spectral surveys available*," said Edwin Bergin, principal investigator of the HEXOS Key Program on Herschel.

HIFI was designed to provide extremely high-resolution spectra and to open new wavelength ranges for investigation, which are inaccessible to ground-based telescopes. "*It is astonishing to see how well HIFI works*," said Frank Helmich, HIFI principal investigator. "*We obtained this spectrum in a few hours and it already beats any other spectrum, at any other wavelength, ever taken of Orion. Organics are everywhere in this spectrum, even at the lowest levels, which hints at the fidelity of HIFI. The development of HIFI took eight years but it was really worth waiting for*." "*HIFI's unprecedented high resolution and stability allows us to construct very detailed models of the density and temperature structure of star-forming clouds," said Tom Phillips. "This view allows us to pierce the veil of star formation and more directly study the chemistry associated with the birth of stars, planets, and in some sense, life*."

The spectrum was obtained only one month after HIFI resumed operations on-board Herschel. In August 2009, HIFI experienced an unexpected voltage spike in the electronic system, probably caused by a high-energy cosmic particle, resulting in the instrument shutting down. The mission team studied the problem and developed a solution that prevents harmful side-effects of this type of event. On 14 January 2010, HIFI was successfully switched back on using its spare electronics and restarted a sequence of testing and verification, ahead of science observations commencing on 28 February. It now rejoins the other two Herschel instruments, SPIRE and PACS, in their exploration of the far-infrared universe.

HIFI is a high resolution spectrometer that senses radiation in seven wavelength bands. NASA provided the mixers and local oscillator chains for the three highest bands, local oscillator components for four other bands, and power amplifiers. The enormous improvement in sensitivity and frequency coverage afforded by HIFI is a result of intense technology development at JPL supported by NASA over more than a decade. Identification of the many spectral features visible in the Orion spectrum with transitions of particular molecular species requires sophisticated molecular spectroscopy databases, which collect the results from many years of laboratory spectroscopy work.

SCIENCE TEAM SAYS GIANT METEORITE, NOT VOLCANOES, KILLED DINOSAURS

A team of scientists, including Elisabetta Pierazzo, a senior scientist at the Planetary Science Institute, has concluded that a giant meteorite impact is still the best explanation for the disappearance of dinosaurs and many other species 65.5 million years ago. The 41 scientists, from Europe, Mexico, Canada, Japan and the United States, published their results today in the highly respected scientific journal Science, concluding that alternative hypotheses are inadequate in explaining the abrupt mass extinction at the end of the Cretaceous period. Scientists refer to this point in the geologic record as the K/Pg boundary, and attribute it to extreme climate change caused by the Chicxulub (Chick-shuh-loob) meteorite impact.

Pierazzo, who began modeling the impact as a Ph.D. student, was the first scientist to develop high-resolution, 3-D simulations of the Chicxulub event as an oblique impact. This work was done in collaboration with David Crawford, of Sandia National Laboratory. The results clearly showed that the effects on Earth's climate were even more dramatic than had been previously hypothesized. The simulation showed huge amounts of sulfur oxides were ejected into the upper atmosphere, drastically altering the Earth's climate.

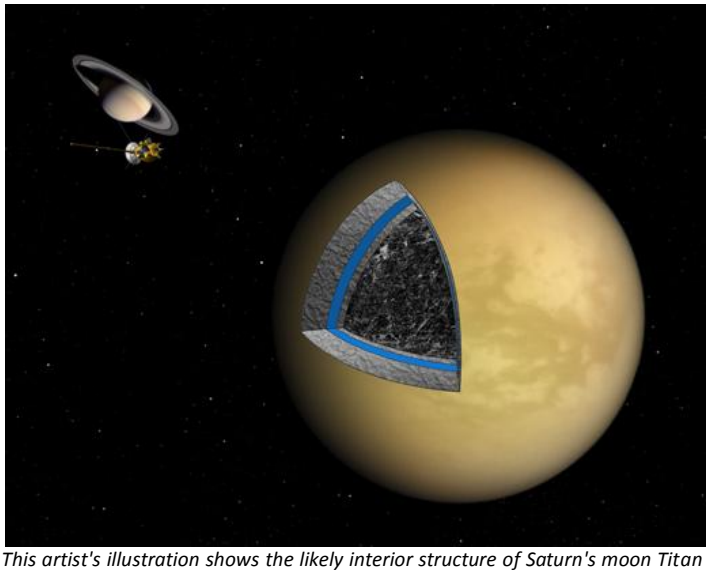
However, some scientists have disputed the Chicxulub hypothesis, attributing the climate change and mass extinctions to volcanic activity in the Deccan Traps, an area on the Indian subcontinent. They theorize that global cooling and acid rain resulting from this volcanic activity were the major cause of mass extinctions, not the Chicxulub impact in Mexico. "*Large amounts of sulfur oxides were injected into the atmosphere during the Deccan volcanism*," Pierazzo said. "*But they were distributed in several pulses that extended over several hundred thousand years before - and after - the K/Pg boundary. Yet, the major, large biotic changes at the end of the Cretaceous era appear to have happened abruptly and exactly at the K/Pg boundary, when Chicxulub hit*."

Marine and terrestrial ecosystems showed only minor changes during the 500,000 years leading up to the K/Pg boundary, the researchers conclude in the Science article. But an abrupt and major decrease in the mass of living things and species diversity occurs precisely at the boundary. This data, along with new data derived from ocean drilling samples and continental sites, as well as reanalysis of previous K/Pg boundary studies, leads the research team to conclude that the Chicxulub impact hypothesis has grown stronger than ever. "*Combining all available data from different science disciplines led us to conclude that a large asteroid impact 65 million years ago in modern-day Mexico was the major cause of the mass extinctions*," says Peter Schulte, lead author of the review paper. According to analysis of the Chicxulub crater in Yucatan, Mexico and other data from the geologic record, scientists conclude that the meteorite was between 10 and 15 kilometers in diameter and hit Earth at a speed 20 times faster than a rifle bullet. The resulting explosion was a billion times larger than the Hiroshima atomic bomb and a million times larger than the biggest nuclear bomb ever tested. http://www.psi.edu/press/

CASSINI DATA SHOW ICE/ROCK MIXTURE INSIDE TITAN

By precisely tracking Cassini spacecraft on its low swoops over Saturn's moon Titan, scientists have determined the distribution of materials in the moon's interior. The subtle gravitational tugs they measured suggest the interior has been too cold and sluggish to split completely into separate layers of ice and rock.

The findings show how Titan evolved in a different fashion from inner planets such as Earth, or icy moons such as Jupiter's Ganymede, whose interiors have split into distinctive layers. "*These results are fundamental to understanding the history of moons of the outer solar system*," said Cassini Project Scientist Bob Pappalardo, commenting on his colleagues' research. "*We can now better understand Titan's place among the range of icy satellites in our solar system*." Scientists have known that Titan, Saturn's largest moon, is about half ice and half rock, but they needed the gravity data to figure out how the materials were distributed. It turns out Titan's interior is a sorbet of ice studded with rocks that probably never heated up beyond a relatively lukewarm temperature.



This artist's illustration shows the likely interior structure of Saturn's moon Titan deduced from gravity field data collected by NASA's Cassini spacecraft. The investigation by Cassini's radio science team suggests that Titan's interior is a cool mix of ice studded with rock, though the outermost 500 kilometers (300 miles) appear to be ice essentially devoid of any rock. Many planets and moons, including the Earth, evolve into a body with a clearly distinct rocky core. This radio science investigation suggests Titan's interior, cool and sluggish, failed to allow the interior to separate into completely differentiated layers of ice and rock. In addition to the hazy surface of Titan (yellow), the layers in the cutaway show an ice layer starting near the surface (light gray), an internal ocean hypothesized from other Cassini data (blue), another layer of ice (light gray) and the mix of rock and ice in the interior (dark gray). In the background are the Cassini spacecraft and Saturn, not to scale. Image credit: NASA/JPL

Only in the outermost 500 kilometers (300 miles) is Titan's ice devoid of any rock, while ice and rock are mixed to various extents at greater depth. "*To avoid separating the ice and the rock, you must avoid heating the ice too much*," said David J. Stevenson, one of the paper's co-authors. "*This means that Titan was built rather slowly for a moon, in perhaps around a million years or so, back soon after the formation of the solar system*." This incomplete separation of ice and rock makes Titan less like Jupiter's moon Ganymede, where ice and rock have fully separated, and perhaps more like another Jovian moon, Callisto, which

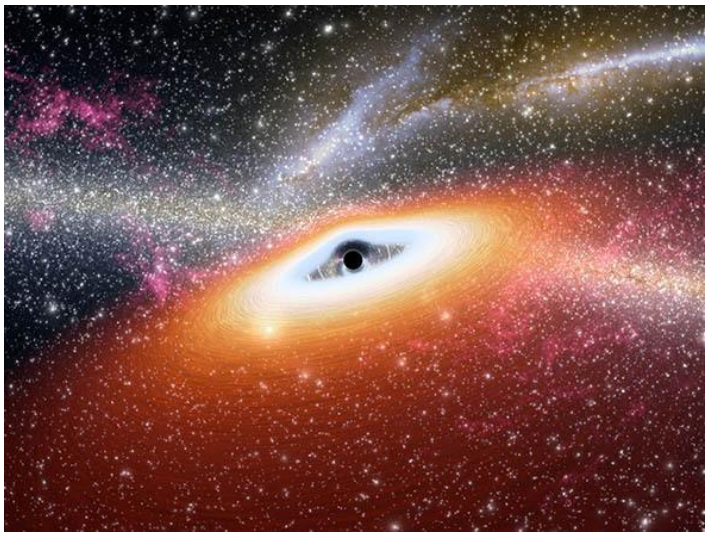
is believed to have a mixed ice and rock interior. Though the moons are all about the same size, they clearly have diverse histories.

The Cassini measurements help construct a gravity map, which may help explain why Titan has a stunted topography, since interior ice must be warm enough to flow slowly in response to the weight of heavy geologic structures, such as mountains. Creating the gravity map required tracking minute changes in Cassini's speed along a line of sight from Earth to the spacecraft as it flew four close flybys of Titan between February 2006 and July 2008. The spacecraft took paths between about 1,300 to 1,900 kilometers (800 to 1,200 miles) above Titan.

"*The ripples of Titan's gravity gently push and pull Cassini along its orbit as it passes by the moon and all these changes were accurately recorded by the ground antennas of the Deep Space Network within 5 thousandths of a millimeter per second [0.2 thousandths of an inch per second] even as the spacecraft was over a billion kilometers [more than 600 million miles] away*," said Luciano Iess, a Cassini radio science team member, and the paper's lead author. "*It was a tricky experiment*." The results don't speak to whether Titan has an ocean beneath the surface, but scientists say this hypothesis is very plausible and they intend to keep investigating. Detecting tides induced by Saturn, a goal of the radio science team, would provide the clearest evidence for such a hidden water layer. A Cassini interdisciplinary investigator, Jonathan Lunine, said of his colleagues' findings, "*Additional flybys may tell us whether the crust is thick or thin today*." "*With that information we may have a better understanding of how methane, the ephemeral working fluid of Titan's rivers, lakes and clouds, has been resupplied over geologic time. Like the history of water on Earth, this is fundamental to a deep picture of the nature of Titan through time*."
http://www.nasa.gov/cassini
http://www.jpl.nasa.gov/news/news.cfm?release=2010-084

SPITZER UNEARTHS PRIMITIVE BLACK HOLES

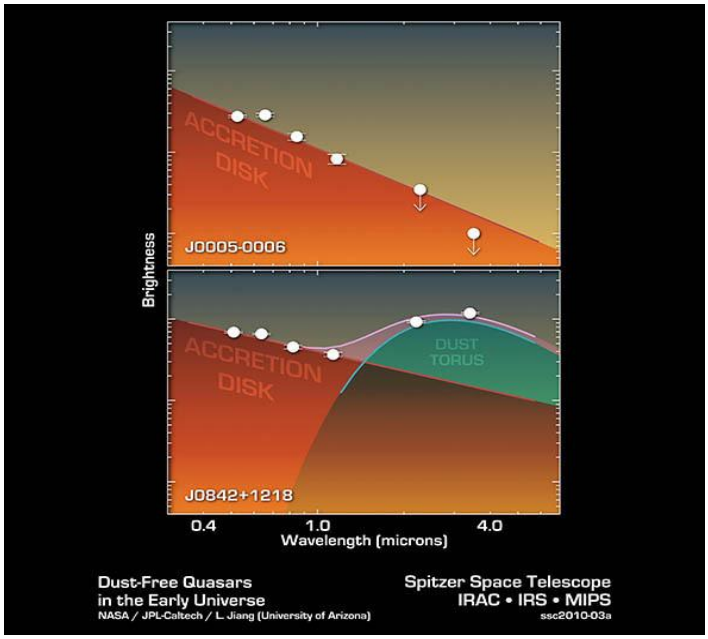
Astronomers have come across what appear to be two of the earliest and most primitive supermassive black holes known. The discovery, based largely on observations with Spitzer Space Telescope, will provide a better understanding of the roots of our universe, and how the very first black holes, galaxies and stars came to be.



Spitzer has identified two -- the smallest on record -- about 13 billion light-years away from Earth. The quasars, called J0005-0006 and J0303-0019, were first unveiled in visible light using data from the Sloan Digital Sky Survey.

"*We have found what are likely first-generation quasars, born in a dust-free medium and at the earliest stages of evolution*," said Linhua Jiang, who is the lead author of a paper announcing the findings.

Black holes are beastly distortions of space and time. The most massive and active ones lurk at the cores of galaxies, and are usually surrounded by doughnut-shaped structures of dust and gas that feed and sustain the growing black holes. These hungry, supermassive black holes are called quasars. As grimy and unkempt as our present-day universe is today, scientists believe the very early universe didn't have any dust -- which tells them that the most primitive quasars should also be dust-free. But nobody had seen such immaculate quasars -- until now.



These two data plots from Spitzer Space Telescope show a primitive supermassive black hole (top) compared to a typical one. As the data show, the typical supermassive black hole, called J0842+1218, exhibits the signs of a surrounding ring of dust, a feature that appears at longer wavelengths of infrared light. The primitive object, called J0005-0006, lacks a dusty torus.

That discovery team, which included Jiang, was led by Xiaohui Fan, a coauthor of the recent paper. Chandra had also observed X-rays from one of the objects. X-rays, ultraviolet and optical light stream out from quasars as the gas surrounding them is swallowed. "*Quasars emit an enormous amount of light, making them detectable literally at the edge of the observable universe*," said Fan. When Jiang and his colleagues set out to observe J0005-0006 and J0303-0019 with Spitzer between 2006 and 2009, their targets didn't stand out much from the usual quasar bunch. Spitzer measured infrared light from the objects along with 19 others, all belonging to a class of the most distant quasars known. Each quasar is anchored by a supermassive black hole weighing more than 100 million suns.

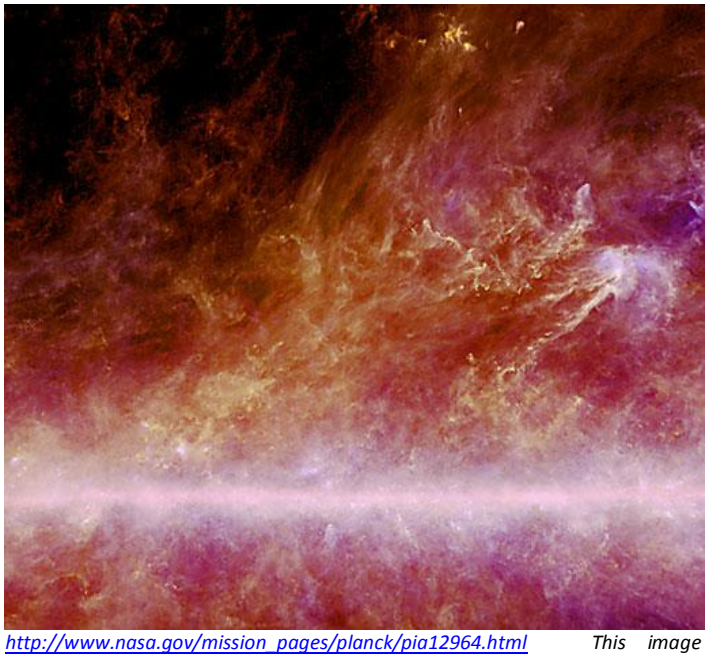
Of the 21 quasars, J0005-0006 and J0303-0019 lacked characteristic signatures of hot dust, the Spitzer data showed. Spitzer's infrared sight makes the space telescope ideally suited to detect the warm glow of dust that has been heated by feeding black holes. "*We think these early black holes are forming around the time when the dust was first forming in the universe, less than one billion years after the Big Bang*," said Fan. "*The primordial universe did not contain any molecules that could coagulate to form dust. The elements necessary for this process were produced and pumped into the universe later by stars*." The astronomers also observed that the amount of hot dust in a quasar

goes up with the mass of its black hole. As a black hole grows, dust has more time to materialize around it. The black holes at the cores of J0005-0006 and J0303-0019 have the smallest measured masses known in the early universe, indicating they are particularly young, and at a stage when dust has not yet formed around them. The Spitzer observations were made before the telescope ran out of its liquid coolant in May 2009, beginning its "warm" mission. http://www.jpl.nasa.gov/news/news.cfm?release=2010-088&cid=release_2010-088

PLANCK MISSION IMAGES GALACTIC WEB OF COLD DUST

Tendrils of the coldest stuff in our galaxy can be seen in a new, large image from Planck, a mission surveying the whole sky to learn more about the birth of our universe.

Planck, a ESA-led mission with participation from NASA, launched into space in May 2009 from Kourou, French Guiana. The space telescope has almost finished its first of at least four separate scans of the entire sky, a voluminous task that will be completed in early 2012. "*We've got huge amounts of data streaming down from space*," said Ulf Israelsson, the project manager for the mission. "*The intricate process of sorting through all of it has begun*."



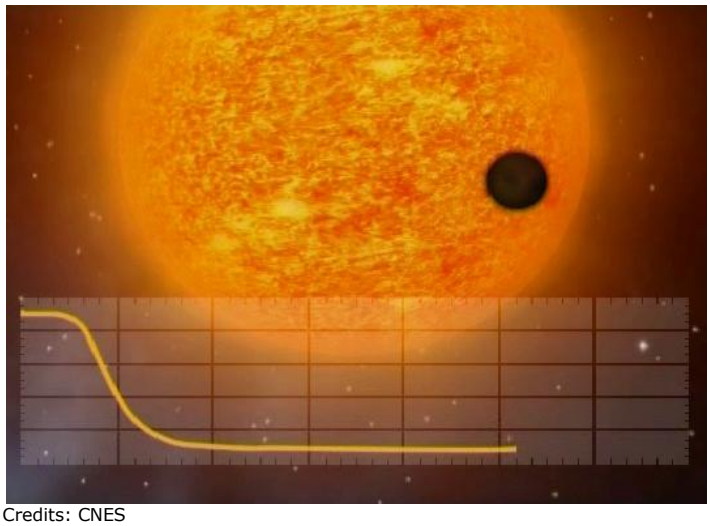
http://www.nasa.gov/mission_pages/planck/pia12964.html This image highlights a swath of our Milky Way galaxy occupying about one-thirteenth of the entire sky. It shows the bright band of our galaxy's spiral disk amidst swirling clouds where gas and dust mix together and, sometimes, ignite to form new stars. The data were taken in the so-called far-infrared portion of the light spectrum, using two of nine different frequencies available on Planck. - NASA

The mission's primary objective is to map the cosmic microwave background -- relic radiation left over from the Big Bang that created our universe about 13.7 billion years ago. Planck's state-of-the-art technology will provide the most detailed information yet about the size, mass, age, geometry, composition and fate of the universe.

In addition to cosmological questions like these, the mission will address such astronomy topics as star formation and galactic structure. "*Planck is the first big cosmology mission that will also have a large impact on our understanding of our galaxy, the Milky Way*," said Charles Lawrence, the mission's NASA project scientist at JPL. "*We can see the cold dust and gas that permeate our galaxy on very large scales, while other missions like Herschel can zoom in to see the detail*." Planck is scheduled to release a first batch of astronomy data, called the Early Release Compact Source Catalog, in Jan. 2011. Cosmology results on the first two years' worth of data are expected to be released in Dec. 2012. http://www.jpl.nasa.gov/news/news.cfm?release=2010-087&cid=release_2010-087

NEWLY DISCOVERED PLANET COULD HOLD WATER

The Corot satellite strikes again with another fascinating planet discovery. This time, the newly discovered gas giant planet may have an interior that closely resembles those of Jupiter and Saturn in our own Solar System.



Credits: CNES

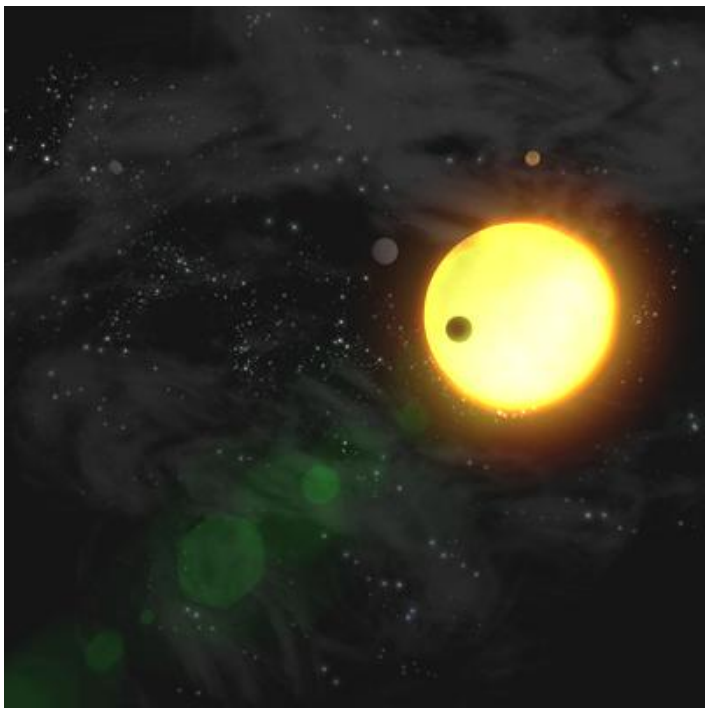
Very few planets are temperate enough to allow the presence of liquid water, but the newly discovered Corot-9b is one of them. It was found on 16 May 2008 and orbits its star every 95.274 days, a little longer than Mercury takes to go round the Sun.

Artist's view of the COROT satellite Credits: CNES/D. Ducros

More than 400 exoplanets have been discovered so far and 70 of them have been found by the 'transit' method. A transit is a kind of eclipse and occurs when a celestial body passes in front of its host star and

blocks some, but not all, of the star's light. This temporarily dims the apparent brightness of the star and enables the planet's mass, diameter, density and temperature to be deduced. The time between similar transits gives the orbital period of the planet.

Corot-9b is the first transiting planet to have both a longer period and a near-circular orbit. Its orbit is slightly elliptical but at closest approach to its parent star it reaches a distance of 54 million kilometers. Although that is only about the distance of Mercury in our Solar System, it is by far the largest orbit of any transiting planet found so far. Because it orbits a star cooler than our Sun, calculations estimate that Corot-9b's temperature could lie somewhere between –23°C and 157°C. Corot-9b has a radius around 1.05 times that of Jupiter but only 84% of the mass. This leads to a density of 0.90 g/cc, or 68% that of Jupiter. "*Corot-9b is the first exoplanet that is definitely similar to a planet in our Solar System*," says Hans Deeg.



Planet transit in front of a star. Credits: ESA 2003. Illustration by AOES Medialab

The similarity is caused by the fact that Corot-9b is sufficiently far from its star to prevent tidal forces from heating its interior. Tidal forces are created by the strength of gravity weakening from the front to back of the celestial body. When the difference between the near side and the far side is great, the tidal force can prevent the planet from spinning quickly, forcing it to only show one face to the star. It can also provide heat to the interior of the planet, changing its physical condition.

Based on calculations, neither of these is possible in this case. "*Although we don't know, because we can't see the planet directly, there is reason to believe that this planet has a normal day-night cycle*," says Malcolm Fridlund, ESA Project Scientist for Corot. It means that lacking a tidal heat source, Corot-9b's interior is likely to have remained similar to the gas giants in our Solar System.

There is also one other tantalizing possibility about this world. Although the planet itself is a gas giant and hence has no solid surface to stand on, what if it possessed a moon like Saturn's Titan? If the temperature were towards the lower end of the estimated range, then any moon would be an ice ball. If it were towards the upper end, it would be rather too hot for liquid water. But what if it were somewhere in the middle? ...

EQUINOX SKY SHOW

When the sun sets on Saturday, March 20th, a special kind of night will fall across the Earth. It's an equal night. Or as an astronomer would say, "*it's an equinox*." It's the date when the sun crosses the celestial equator heading north. Spring begins in one hemisphere, autumn in the other. The day and night are of approximately equal length.

To celebrate the occasion, Nature is providing a sky show. It begins as soon as the sky grows dark. The Moon materializes first, a fat crescent hanging about a third of the way up the western sky. Wait until the twilight blue fades completely black and you will see that the Moon is not alone. The Pleiades are there as well.

The Moon and the Pleiades are having a close encounter of rare beauty. There's so little space between the two, the edge of the Moon will actually cover some of cluster's lesser stars. According to David Dunham of the International Occultation Timing Association, this is the best Moon-Pleiades meeting over the United States until the year 2023.

A similar Moon-Pleiades conjunction from Szubin, Poland, in July 2009. Credit: NASA, photographed by Marek Nikodem.

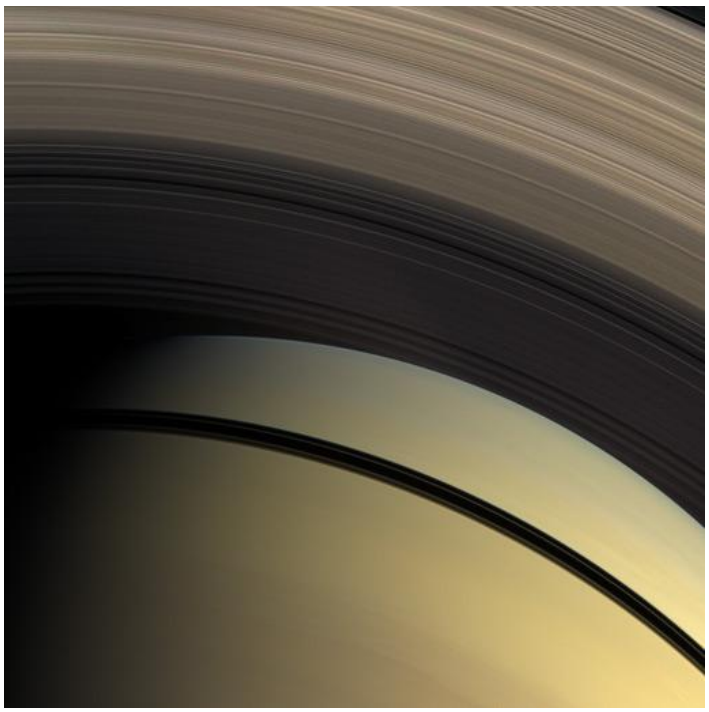
The Pleiades are a cluster of young stars some 440 light years from Earth. They formed from a collapsing cloud of interstellar gas about 100 million years ago. By the standards of astronomy, that's really young. The Earth under your feet is almost 50 times older. Dinosaurs were roaming our planet long before the Pleiades popped into being.

Only about seven of the Pleiades are visible to the unaided eye. The "Seven Sisters" are Sterope, Merope, Electra, Maia, Taygete, Celaeno and Alcyone, named after daughters of the mythological Greek god Atlas. Together, they form the shape of a little dipper, which is why the Pleiades are often mistaken for the Little Dipper, an asterism of Ursa Minor.

Binoculars are highly recommended for this event. First, scan the Moon. You'll see craters, mountains and lava seas. Note that you can see the entire Moon, not just the brightly-lit crescent. The Moon's dark terrain is illumined by a ghostly glow called "Earthshine." It is the light of our own blue planet shining down on the Moon. Next, scan the sky around the Moon. The Pleiades come into sharp focus---and they are more than seven. Dozens of faint "sisters" can be seen through even modest optics. This night doesn't sound equal. It sounds much better than that. Experience the equinox!

CASSINI SHOWS SATURNIAN ROLLER DERBY, STRANGE WEATHER

From our vantage point on Earth, Saturn may look like a peaceful orb with rings worthy of a carefully raked Zen garden, but the Cassini spacecraft has been shadowing the gas giant long enough to see that the rings are a rough and tumble roller derby. It has also revealed that the planet itself roils with strange weather and shifting patterns of charged particles. Two papers synthesize Cassini's findings since arriving at Saturn in 2004. "*This rambunctious system gives us a new feel for how an early solar system might have behaved*," said Linda Spilker, a planetary scientist and the new Cassini project scientist. "*This kind of deep, rich data can only be collected by an orbiting spacecraft, and we look forward to the next seven years around Saturn bringing even more surprises*." In the paper describing the elegant mess of activity in the rings, lead author Jeff Cuzzi, Cassini's interdisciplinary scientist for rings and dust, describes how Cassini has shown us that collisions are routine and chunks of ice leave trails of debris in their wakes. Spacecraft data have also revealed how small moons play tug-of-war with ring material and how bits of rubble that would otherwise join together to become moons are ultimately ripped apart by the gravitational pull that Saturn exerts.



This natural color view highlights the myriad gradations in the transparency of Saturn's inner rings. The dark shadows of the rings separate Saturn's southern hemisphere in the bottom of the image from the north. The innermost D ring is invisible, laid over the planet's northern hemisphere. The translucent C ring runs through the middle of the image. The denser B ring stretches across the top of the image. This view looks toward the sunlit side of the rings from about 48 degrees below the ringplane. Image Credit: NASA/JPL/Space Science Institute

During equinox, the period when sunlight hits the rings exactly edge-on, Cassini witnessed rings that are normally flat – about tens of meters (yards) thick – being flipped up as high as the Rocky Mountains. The spacecraft has also shown that the rings are composed mostly of water ice, with a mysterious reddish contaminant that could be rust or small organic molecules similar to those found in red vegetables on Earth. "*It has been amazing to see the rings come to life before our very eyes, changing even as we watch, being colorful and taking on a tangible, 3-D nature*," Cuzzi said. "*The rings were still a nearly unstructured object in even the best telescopes when I was a grad student, but Cassini has brought us an intimate familiarity with them*."

Cuzzi said Cassini scientists were surprised to find such fine-scale structure nearly everywhere in the rings, forcing them to be very careful about generalizing their findings across the entire ring disk. The discovery that the rings are clumpy has also called into question some of the previous estimates for the mass of the rings because there might be clusters of material hidden inside of the clumps that have not yet been measured. In the paper on Saturn's atmosphere, ionosphere and magnetosphere, lead author Tamas Gombosi, Cassini's interdisciplinary scientist for magnetosphere and plasma science, describes how Cassini helped scientists understand a south polar vortex that has a diameter 20 to 40 times that of a terrestrial hurricane, and the bizarrely stable hexagon-shaped jet stream at the planet's north pole. Cassini scientists have also calculated a variation in Saturn's wind speeds at different altitudes and latitudes that is 10 times greater than the wind speed variation on Earth. According to Gombosi's paper, Cassini has also shown us that the small moon Enceladus, not the sun or Saturn's largest moon Titan, is the biggest contributor of charged particles to Saturn's magnetic environment. The charged particles from Enceladus, a moon that features a plume of water vapor and other gases spraying from its south polar region, also contribute to the auroras around the poles of the planet. "*We learned from Cassini that the Saturnian magnetosphere is swimming in water*," Gombosi said. "*This is unique in the solar system and makes Saturn's plasma environment particularly fascinating*."

Of course, Cassini's intense investigation has opened up a host of new mysteries. For example, Cassini has shown us images of occasional cannon-ball-like objects that rocket across one of the outer rings known as the F ring, without many clues about where they came from or why they quickly disappear. Learning more about a kind of radio emission known as "kilometric radiation" at Saturn has unsettled debates about the planet's rotation rate rather than settled them. While the regular periods of kilometric radiation have given scientists a sense of the rotation rate at Jupiter, Saturn has clocked different periods for the radiation during NASA's Voyager flybys in 1980 and 1981 and the nearly six years of Cassini's investigations. The modulations vary by about 30 seconds to a minute, but they shouldn't be varying at all. The inconsistency may be related to a source in the magnetic bubble around the planet rather than the core of the gas giant, but scientists are still debating. "*Cassini has answered questions we were not even smart enough to ask when the mission was planned and raised a lot of new ones*," Cuzzi said. "*We are hot on the trail, though*." http://www.jpl.nasa.gov/news/news.cfm?release=2010-090&cid=release_2010-090 http://www.nasa.gov/cassini http://saturn.jpl.nasa.gov .

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
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In March's StarGazer:

The next EAS Meeting is 7:00 pm, Saturday March 20th at Jack & June Barnes home 'Possum Works' observatory.