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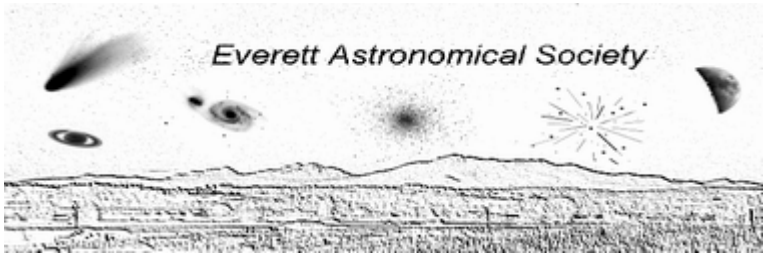

The Stargazer

November 2007

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(change 'at' to @ to send email) http://members.tripod.com/everett_astronomy

EAS BUSINESS…

NEXT EAS MEETING – SATURDAY DECEMBER 1ST AT 3:00 PM AT THE EVERETT PUBLIC LIBRARY, IN THE AUDITORIUM (DOWNSTAIRS)

★★ Saturday December 1st 3:00 pm MEETING ★★
The speaker will be - Andrew Connolly - from University of Washington Astronomy department, and the 'daddy' of Google Sky, who will be speaking about 'Google Sky and its Potential as a Link Between Amateur and Professional Astronomy'.

Map to library - http://www.epls.org/about/mlmap.htm

2702 Hoyt Avenue
Everett, WA 98201

Directions to library - http://www.epls.org/about/mldirect.htm

EAS HOLIDAY DINNER MEETING – SATURDAY DECEMBER 8TH AT 7:00 PM AT ALFY'S PIZZA ON BROADWAY. SPEAKER WILL BE DR. RON HOBBS, A NASA SOLAR-SYSTEM AMBASSADOR, TAKING US ON A 'BARNSTORMING TOUR OF THE SOLAR SYSTEM'. (BRING A WRAPPED GIFT TO EXCHANGE IF YOU WISH)

★ STAR PARTY INFO ★

Upcoming EAS star party schedule: (also see the regional star parties listed in the 'Astro Calendar for 2007')

EAS scheduled star parties are suspended until spring due the cloudy weather.

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@nwlink.com) 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.

Planned events are 'On hold' until spring weather returns in March or so – call Ron about spur-of-the-moment observing.

Please also join the EAS mail list, and send mail to the mail list *everett_astronomy@topica.com* to coordinate spur-of-the-moment observing get-togethers, on nights when the sky clears. We try to hold informal close-in star parties each month during the spring, summer, and fall months on a weekend near the New moon at a member's property or a local park. (call Jim Bielaga at (425) 337-4384 for info or check the EAS website.) Members contact Jim Bielaga for scope borrowing.

$$ - FINANCIAL HEALTH - $$

The club maintains a $950+ balance. We try to keep approximately a $500 balance to allow for contingencies. .

CLUB SCOPES

SCOPE	LOAN STATUS
10-INCH WARD DOBSONIAN	AVAILABLE
10-INCH SONOTUBE DOBSONIAN	AVAILABLE
8-INCH DOBSONIAN	AVAILABLE

EAS members: contact VP James Bielaga at (425) 337-4384 or jamesbielaga at aol.com to borrow a scope.

EAS MEMBER NEWS

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

"Show your club membership card at Jim Bielaga's new astronomy store 'Aurora Astro Products' and receive a 10% discount on all purchases. This is an exclusive discount to E.A.S. members only.

I am proud to be able to offer this discount to Everett club members, and thanks for the support you have shown me on

opening my new store. Also I have made great friends and learned a lot being a club member since 1991.

- Clear Skies, Jim Bielaga"

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

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

Does Anyone know about the history of the EAS ???

The Northwest Region of the Astronomical League (NWRAL) is putting together a new website and needs the following information from each club of the NWRAL. The EAS is looking for any information from members about the early history. Please contact Mark Folkerts if you have any info that could be of help. NRWAL would like a brief history of the club
- Club established date (approx 1986 ?)
- Who started the club (Terry Bacon, et. al.)
- When club joined the Astronomical League.

ASTRO CALENDAR FOR 2007

November 2007

Nov 03 - Taurids Meteor Shower Peak
Nov 04 - End Daylight Saving time - Set Clock Back 1 Hour (US)
Nov 07 – Wednesday 7:00 pm, EAS meeting, Everett Public Library
Nov 10 - Saturday, EAS Star party at Ron Tam's
Nov 12 - Dwarf Planet Ceres Closest Approach To Earth (1.832 AU)
Nov 17 - Leonids Meteor Shower Peak
Nov 22 - Thanksgiving Holiday

December 2007

Dec 01 – Saturday 3:00 pm, EAS meeting, Everett Public Library
Dec 07 – Saturday 7:00 pm, EAS holiday banquet meeting, Alfy's Pizza (on Broadway)
Dec 07 - 35th Anniv (1972), Apollo 17 Launch (Last Mission to Moon)
Dec 13 - Geminids Meteor Shower Peak
Dec 22 - Winter Solstice, 22:06 UT
Dec 22 - Ursids Meteor Shower Peak
Dec 24 - Mars at opposition
Dec 25 - Christmas Holiday

UW Astronomy Speakers Colloquium Schedule

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

ON THE AIRWAVES - KSER 90.7 - 'IT'S OVER YOUR HEAD'

"Our group of radio script writers now consists of EAS and SAS members Jim Ehrmin, Greg Donohue, and Ted Vosk, who are now regularly writing and helping to produce our **astronomy radio show**, "**It's Over Your Head"** on radio station **KSER, FM 90.7.** The six-minute segment is broadcast **every Wednesday morning at approximately 7:20 A.M.** and gives a weekly look at what's up in the sky over Snohomish County, with other information. If you are a listener to the program, show your support by giving the program director of KSER a call!" Web page with lots of archives and other info is available at http://www.itsoveryourhead.org/

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

EAS MEMBERSHIP BENEFITS & INFORMATION

EAS Benefits -
Membership in the **Everett Astronomical Society** (EAS) includes invitations to all of the club meetings and star parties, plus the monthly newsletter, ***The Stargazer.*** Currently, a 10% discount is also being offered to EAS members for purchases at Aurora Astro Products in Everett

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

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

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

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

EAS Library -
Membership will give you access to all the material in the lending library. The library, which is maintained by Mike Locke, consists of VCR tapes, DVDs, many books, magazines, and software titles. The EAS has a library of books, videotapes, and software for members to borrow. We always value any items you would like to donate to this library. You can contact a club officer or **Librarian Mike Locke**, phone (425) 259-5995, email lockemi at comcast.net, to borrow or donate any materials. See list here: http://members.tripod.com/everett_astronomy/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://members.tripod.com/everett_astronomy/application.htm

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

OBSERVER'S INFORMATION…

LUNAR FACTS

Dec 01	Last Quarter Moon
Dec 09	New Moon
Dec 17	First Quarter Moon
Dec 24	Full Moon
Dec 31	Last Quarter Moon
Jan 08	New Moon
Jan 15	First Quarter Moon
Jan 22	Full Moon
Jan 30	Last Quarter Moon
Feb 07	New Moon
Feb 14	First Quarter Moon
Feb 21	Full Moon

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

UP IN THE SKY -- THE PLANETS

Object	Rises	Sets	Con	Mag
Sun	**07:37 am**	**16:18**	**Oph**	**-27.5**
Mercury	**06:52 am**	**15:49**	**Lib**	**+0.7**
Venus	**03:38 am**	**14:32**	**Vir**	**-4.1**
**** Mars ****	**18:00**	**10:25 am**	**Gem**	**-1.3**
Jupiter	09:00 am	17:20	Oph	-1.7
Saturn	**23:22**	**12:57**	**Leo**	**+0.7**
Uranus	**12:59**	**00:07 am**	**Aqr**	**+5.8**
Neptune	**12:02**	**21:50**	**Cap**	**+7.9**
Pluto	08:35 am	18:02	Sag	+14.0

(times local time for Everett PST)

Observing Jupiter's Moons – Java tool
http://skytonight.com/observing/objects/javascript/jupiter

Transit times for Jupiter's Great Red Spot in 2007
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 –
http://spaceflight.nasa.gov/realdata/sightings/SSapplications/Post/SightingData/Seattle.html

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

CONSTELLATIONS OF THE MONTH – GEMINI & TAURUS

GEMINI: The Twins, as this winter constellation is also known, borders on the constellations of Auriga, Cancer, Canis Minor, Lynx, Monoceros, Orion, and Taurus, and ranks 26th in overall brightness among the constellations, containing 47 stars brighter than magnitude 5.5. Its central point is located at RA=7h,1m and Dec.= +22.5 degrees. It is completely visible from latitudes North of –55 degrees, and completely invisible from latitudes South of –80 degrees; this constellation ranks 30th in overall size. Gemini's most famous bright stars are Castor (Alpha) and Pollux (Beta), better known as "The Twins". Gemini has two associated meteor showers: the Epsilon Geminids (19 Oct.), and the Geminids (14 Dec.), and one Messier object: the open cluster M35 (NGC 2168). Two of the planet "discoveries" took place within this constellation. In 1781 William Herschel found the planet Uranus near Eta Geminorum; in the first half of this century (1930), Clyde Tombaugh (working at Flagstaff's Lowell Observatory), discovered Pluto near Delta Geminorum. Castor, appearing as one star to the naked eye, is officially designated as a triple star, but is in reality six stars, each of the three having a companion. Studies indicate that star systems containing more than six stars will more rapidly become unstable and separate. Gemini's midnight culmination date is January 5th, so try to enjoy the beauty of this constellation, and its beautiful and interesting neighbors, on the next clear night.

TAURUS: The Bull, as this late fall and winter constellation is also known, borders on the constellations of Aries, Auriga, Cetus, Eridanus, Gemini, Orion, and Perseus, and ranks 12th in overall brightness among the constellations, containing 98 stars brighter than magnitude 5.5. Associated asterisms involving Taurus include The Heavenly G, The Hyades, The Pleiades, The V, The Winter Octagon, and the Winter Oval. Its central point is located at RA=4h,39m and Dec.= +15.5 degrees. It is completely visible from latitudes North of –59 degrees, and portions of it are visible worldwide; this constellation ranks 17th in overall size, and takes up 797.25 square degrees (or 1.933% of the sky). Some of Taurus's most famous bright stars are Aldebaran, Merope, Alcyone, Electra, Pleione, Sterope, and Nath and El Nath. Taurus has three associated meteor showers: the Daytime Beta Taurids (29 June); the S. Taurids (3 November) and the N. Taurids (13 November); this wonderful constellation also contains two Messier objects: M1 (the Crab Nebula) and M-45 (the Pleiades). Aldebaran is one of the four Royal Stars of the ancient Persians. The star Beta Tauri was once shared by both the constellations of Auriga and Taurus; before the 20th century, star catalogs frequently listed this star as gamma Aurigae. Ever since the

Belgian astronomer Delporte's standards for constellation boundaries were adopted, this star has been officially part of Taurus. M-45 (the Pleiades or "Seven Sisters") is the brightest open cluster in the sky. It is also one of the few members of Messier's list which does not possess a corresponding NGC number (probably because it is too bright); indeed, some cataloguers down through history had listed the Pleiades as a separate and distinct constellation. About one degree north of Zeta Tauri lies M-1 (the Crab Nebula, which received its name from Lord Rosse in the mid-19th century when he noticed that its broad filaments resembled a crab's pincers. The Crab Nebula is a gaseous remnant of a supernova which first became visible in 1054, and is the brightest supernova remnant in the sky. It is within this beautiful constellation that the Italian astronomer Piazzi discovered the first asteroid, Ceres, on New Year's Day, 1801. Taurus has a midnight culmination date of November 30th (and a solar conjunction date of June 2): try to enjoy the beauty of this wonderful constellation, and its interesting neighbors, on the next clear fall or winter night.

YOUNG ASTRONOMER'S CORNER

The Young Astronomer's Corner will repeat a column topic that people frequently have questions about (stellar and planetary "twinkling").

Twinkle, Twinkle, Little Star…and Do Planets Twinkle Too?

We know that stars "twinkle", but why is that(?); and on a related note, do planets "twinkle" too? Additionally, if you were an astronaut orbiting the Earth above its atmosphere, would either the stars or planets appear to twinkle to him or her? Let's explain some things first, and then answer the questions. Twinkling results from different densities, or different layers of temperature, moisture, and resulting "weights" of air, which comprise our atmosphere. These different densities cause swirling currents of air, and are responsible for the shimmering effect you see in the warmed layers of air above a hot surface (similar to driving down a highway in the middle of the California desert in July). If there is enough air separating the observer (you) from the object (star, planet, or highway), it will appear to shimmer (or "twinkle"). From Earth, there is enough air (or atmosphere) separating the stars and planets, especially at the horizon where there is the most atmosphere to look through. This is why stars and planets seem to shimmer or twinkle most when they are rising or setting. At the horizon, the color of the object you are looking at can even change because the direction of the light is changed by the atmosphere to the greatest degree at the horizon (this is called refraction). However, planets appear to twinkle less because they present a bigger angle in the sky, simply because they are closer: that is, the air currents do not alter our line of sight (refract the light) as much as they can for stars, which appear far smaller to us, even in larger telescopes., because they ARE so far away. The different air densities in our atmosphere cause the currents which alter our line of sight; this causes the twinkling. There is also a more biological reason for perceiving this twinkling from stars and, less readily, planets. Only a very small amount of starlight actually enters our eyes because they are so far away. We have light detecting elements in our eyes and retina called rods and cones. The rods are used more for night vision, and this small amount of star light activates only a very few rods. When the small amount of starlight is disturbed by the Earth's atmosphere, this causes the starlight to bounce from one rod to the other, turning off one rod and activating and turning on another. Our brain picks up this bouncing light as twinkling!!!! Planets on the other hand appear to shimmer or twinkle less simply because they are closer to us: they send more light to our eyes and form a larger image on our retina and rods. As such, light from planets activates far more retinal rods than does starlight. When several rods are turned on at once, if one or two are turned off, there is not an apparent change or disturbance (i.e., shimmer) to us. That is, the image of the planet is large enough (with more light sent to our eyes) that you don't notice the disturbances caused by the atmosphere quite as easily as you do with stars, unless the disturbances are very pronounced at the horizon. So the answers to our questions as posed above are first: both stars and planets appear to shimmer or twinkle at times, and secondly, an astronaut will not notice any twinkling because they are orbiting high above....you guessed it…the Earth's atmosphere, far beyond the shimmering air densities!!!

ASTRONOMY AND TELESCOPE LINGO - ASTRONOMY "FUN FACTS"

★★ These two columns are taking a break this month; they will both return in the December edition of the EAS Stargazer**.**

PLANETARY FOCUS - MARS

"Planetary Focus" is a periodic column that is published occasionally in the EAS "Stargazer". If you have a favorite planet that you would like similar information and/or statistics on, please contact newsletter co-editor Bill O'Neil. For the month of November, our guest planet is Mars.

Mars is currently located in Gemini (see "Constellation(s) of the Month" above) and approaching opposition at Christmas time 2007, and these are the facts:

Rotation around the Sun: every 686.98 days

Orbit: from 1.38 (closest or 'perihelion') to 1.67 (furthest or 'aphelion')

Astronomical Units (AU)*; this is an orbit that varies between approximately 128.3 and 155.3 million miles from the sun. (*Note: One AU equals approximately 93 million miles).

Inclination of Orbit to Ecliptic: 1.9 degrees.

Diameter at Equator: 6,795 kilometers (or 4,077 miles).

Mass: 0.11 (approximately one-tenth as massive as the Earth); (5.9742 x (10 e24 (10 to the 24th power)) kilograms = 1 Earth Mass).

Density: 3.9 times that of water (global density).

Period of Rotation on its own axis: 24 hours, 37.4 minutes.

Axis tilt: 25.19 degrees.

Satellites (moons): two (Phobos and Deimos).

Special Notes About Mars:

Mars is the nearest superior (outside of Earth's orbit) planet to the Earth. Some of Mars' physical characteristics (such as period of rotation and axis tilt), make it similar to Earth in some respects. Mars has an orange-red surface, and white polar ice caps that expand and contract with the Martian change of seasons. The Martian surface has what are known as "maria" (seas); the maria have been shown to be areas of darker bedrock, upon which Martian winds deposit varying amounts of lighter-colored dust; this contributes to some of the changing faces of Mars that are observable through telescopes. Not very long ago, many people (including famous scientists such as Percival Lowell) thought that Mars had "canals" that were constructed instead of natural (which contributed to the myth of actual "Martians" who built them as "irrigation ditches"). Visiting spacecraft however, have never found evidence of any such canal construction.

The Martian atmosphere has a surface pressure of about 7 millibars, much less than that of the Earth (average sea level atmospheric pressure for Earth is 1013.25 millibars). The atmosphere of Mars extends out to include an ionosphere located at between 100 and 300 kilometers. Daytime temperatures seldom exceed zero degrees Celsius on most of the planet, and most areas experience minimum temperatures as low as minus 140 degrees Celsius before sunrise. Viking spacecraft tests in 1976 showed the Martian atmosphere to be mainly carbon dioxide (about 95%), with smaller percentages of nitrogen, argon, oxygen, water vapor, carbon monoxide, krypton, and xenon. This water vapor sometimes freezes to form ice crystal clouds or fog in lower-lying areas. Global dust storms on the planet are not unusual, but apparently do not manifest themselves every year. Mars has no radiation belts, and has only a weak magnetic field. This latter fact suggest that Mars lacks a molten nickel-iron core such as that present in the Earth. Impact craters dominate Mars' southern regions, but are less prevalent over the younger, more volcanic northern regions of the planet. Two very famous surface features of Mars should be mentioned. Valles Marineris is a vast equatorial canyon system, which measures 4500 kilometers from east to west, and 150 to 700 kilometers from north to south. Some canyons within this system can be up to 200 kilometers wide and 7 kilometers deep (Arizona's Grand Canyon is only 28 kilometers wide and 2 kilometers deep by comparison!). These canyons appear to result from faults in, and collapse of, the Martian surface. The Tharsis Ridge and Elysium Planitia are the two main areas of Martian volcanic activity, but Olympus Mons, lying to the NW of the Tharsis Ridge, is the largest volcano on Mars, and is possibly the largest in the solar system. Its base is over 600 kilometers across, and it rises to a caldera that is 90 kilometers across, at a height of 28 kilometers above the surrounding plains. The volcanoes on Mars are shield-type volcanoes, (such as those found in Hawaii), and have long gently-sloping sides.

Many probes (from the U.S. and the former Soviet Union) down through the years have explored Mars. Some of the more famous ones (successful or failed) include Mars Observer, Viking 1 and 2, several of the Mariner probes, Mars Pathfinder, and the Mars Global Surveyor. The next favorable opposition of Mars will occur in 2003, when Mars will be very close to the Earth. Try to enjoy this beautiful planet when visible anytime, but most especially, as for any superior (outside) planet, at opposition.

"MIRROR IMAGES"

"MIRROR" IMAGES": Because we live in the Northern Hemisphere, we often tend to focus (in both observing and reading) on celestial objects in this hemisphere. The point of this column is to inform club members about similar objects in the Southern Hemisphere (to the ones we are already familiar with in the Northern Hemisphere). The general class of object will first be defined, and then a representative object from each hemisphere will be described. Note: "MIRROR" IMAGES" is strictly the name of this column, and is not intended to imply that there is optical mirror symmetry between the two objects.

CLASS OF OBJECT: Cluster of Galaxies (or Galaxy Cluster): This is a grouping of galaxies, which may contain as much as a few thousand member galaxies. The majority of galaxies appear to occur in clusters or in smaller groups such as

doublets or triplets. The Local Group (of which the Milky Way is a member), is a smaller, irregular galaxy cluster; irregular clusters may be large or small, but tend to contain more variable types of galaxies as members (e.g., barred spirals, ellipticals, regular spirals). The larger, denser clusters tend to have more uniform membership amongst their hundreds or thousands of members (for example, most members of the group may be elliptical galaxies, rather than a more variable mix). Adjacent galaxy clusters are grouped into larger superclusters. Rich galaxy clusters are those with higher concentrations of galaxies in their centers; the Abell Catalogue lists many of this latter type, and the Coma and Perseus clusters are examples. The mass required to keep the galaxies in rich clusters gravitationally bound is about 10 times greater than the mass actually observed. The large amount of hot gas that galaxy clusters have been shown to contain is not sufficient to explain this "missing mass". In irregularly shaped clusters, the gas is associated with individual galaxies, but in regular galaxy clusters, this gas has been shown to form more of a large common pool between the galaxies; this "regular cluster" gas then is more enriched as a result of cluster member interactions, and tends to be more metallic as a result.

Hot, intracluster gas loses energy via X-ray radiation; gas in the cluster core is most dense. Cooling gas flows inward towards the center of the cluster to maintain the pressure required to support the mass of the outer hot atmosphere; this forms a cooling flow. Cooling flows have been detected from X-ray spectra in 70-90% of all larger galaxy clusters; these cooling flows can deposit up to several hundred solar masses per year towards the center of the cluster. A significant portion of this flow will be deposited to the centrally located cD galaxy, which are the most massive galaxies yet detected. Recent studies show that galaxy clusters are a relatively recent phenomenon, evolving from the merging of smaller clusters to form the rich clusters observed today. More distant galaxy clusters show a greater proportion of blue galaxies; this color is due to star formation (initiated either by ram pressure stripping of galaxies in merging subclusters, or by interactions between galaxies on the periphery of the cluster).

REPRESENTATIVE NORTHERN HEMISPHERE OBJECT: Virgo Cluster: A giant irregular galaxy cluster lying near the North Galactic Pole in the constellation of Virgo. With a distance of approximately 15 megaparsecs, it is the nearest large cluster to earth. About 2,500 galaxies have been observed in this cluster, and about 75% are spirals; the remaining members are mostly ellipticals. One of this cluster's brightest members (the giant elliptical M-87), is a radio source and an X-ray source, and the X-ray halo around this galaxy is contributing about 10 solar masses per year to the slight cooling flow. Another large member of the group (M-86), is, (in addition to being an X-ray source as well), exhibiting this X-ray source as a 'plume' directed away from the center of the galaxy; this is as a result of the gas being stripped away from the galaxy by ram pressure as it descends into the cluster proper. The Virgo cluster is the center of the Local Supercluster, which itself exerts a considerable gravitational influence on the Local Group of galaxies, of which the Milky Way is a member.

REPRESENTATIVE SOUTHERN HEMISPHERE OBJECT: Fornax Cluster: This cluster in the constellation of the same name contains 18 bright galaxies and at least 10 fainter ones; these are all compressed into an area of about a 6-degree diameter circle, and most members lie between 20 and 25 megaparsecs away from Earth. NGC-1380 is at the center of the cluster, and is a lenticular shaped galaxy. There are several other member galaxies within the one degree field of this central cluster galaxy: it is possible to see nine galaxies total with NGC-1380 centered. There are still other galaxies just outside this immediate area. About one degree southwest of this main cluster is NGC-1365, also known as the "Great Barred Spiral of Fornax". NGC-1365 shines at magnitude 9.5, and measures 9.8' x 5.5'; it is

one of the brightest galaxies in the area, and the spiral arms and bar structure are visible in backyard telescopes.

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

HOLIDAY WISHES FROM THE HUBBLE SPACE TELESCOPE

Resembling festive lights on a holiday wreath, this Hubble Space Telescope image of the nearby spiral galaxy M74 is an iconic reminder of the impending season. Bright knots of glowing gas light up the spiral arms, indicating a rich environment of star formation.

Messier 74, also called NGC 628, is a stunning example of a "grand-design" spiral galaxy that is viewed by Earth observers nearly face-on. Its perfectly symmetrical spiral arms emanate from the central nucleus and are dotted with clusters of young blue stars and glowing pink regions of ionized hydrogen (hydrogen atoms that have lost their electrons). These regions of star formation show an excess of light at ultraviolet wavelengths. Tracing along the spiral arms are winding dust lanes that also begin very near the galaxy's nucleus and follow along the length of the spiral arms.

M74 is located roughly 32 million light-years away in the direction of the constellation Pisces, the Fish. It is the dominant member of a small group of about half a dozen galaxies, the M74 galaxy group. In its entirety, it is estimated that M74 is home to about 100 billion stars, making it slightly smaller than our Milky Way. The spiral galaxy was first discovered by the French astronomer, Pierre Méchain, in 1780. Weeks later it was added to Charles Messier's famous catalog of deep-sky objects.

This Hubble image of M74 is a composite of Advanced Camera for Surveys' data taken in 2003 and 2005. The filters used to create the color image isolate light from blue, visible, and infrared portions of the spectrum, as well as emission from ionized hydrogen (known as HII regions). A small segment of this image used data from the Canada-France-Hawaii Telescope and the Gemini Observatory to fill in a region that Hubble did not image. http://hubblesite.org/news/2007/41

M74 – Grand Spiral

CLIMATE AND EVOLUTION OF VENUS

Today, Venus is a hellish place of high temperatures and crushing air pressure. Venus Express is showing that this was not always the case. Instead, some time in the past, Venus was probably much more Earth-like and contained large quantities of water. Planetary scientists have long wondered just how Earth-like Venus is or might have been. Until the 1960s, astronomers speculated that Venus might be a tropical forest planet. This view changed when microwave observations began to suggest an extremely hot surface. The Russian and American spacecraft of the 1960s and 70s confirmed that Venus possesses surface temperatures of over 400 C and surface pressure a hundred times that of Earth.

The winds in Venus' atmosphere are severe, blowing at speeds of up to, and over, a 100 m/s. Yet, as fierce as they are, not even the winds from the giant south polar vortex extend all the way down to the planet's surface. Venus Express can see down to about 45-50 km above the surface in the south polar region. Feeding this data into computer models suggests that the vortex cannot penetrate into the lower atmosphere because of the great density of gas there. "*It is difficult to move around such a heavy mass of atmosphere. We do not expect big winds at the surface of Venus*," says Giuseppe Piccioni.

How did Venus turn out like this?

Geologists say that the present is a clue to the past and the same is true for atmospheric physics. Venus Express has revealed an atmospheric process that points to a catastrophic event in Venus' history.

"*Venus has suffered a radical climate disaster but we don't yet know how, why and when*," says David Grinspoon, a Venus Express interdisciplinary scientist. The disaster was the loss of Venus' water. If you could condense all of the water vapor in Venus' atmosphere, it would create a thin covering of water just 3-cm thick. For comparison, if Earth were a smooth ball, all of the water in the oceans and atmosphere would create a covering 3-km deep. Venus may once have had this much water as well but it has been gradually stripped off into space by the collision of energetic particles from the Sun. Today, Venus Express has shown that the last remnants of the process are still taking place with the escape of hydrogen and oxygen from the top of the atmosphere. "*We now know that Venus was once more Earth-like*," says Grinspoon, "*We cannot tell the full story yet, but the data we are getting shows that Venus Express will reveal the history of water on Venus*."

Venus has no seasons because its rotation axis is already perpendicular to its orbit. It rotates just once in 243 Earth days and has a very massive atmosphere. This is chiefly composed of carbon dioxide with clouds primarily of sulfuric acid droplets. It sounds nothing like Earth, and yet, thanks to Venus Express, planetary scientists now know that it can be explained in the same framework, but with Venus being driven in a different direction. "*The three most important parameters that determine a planet's 'behavior' are its distance from the Sun, its surface pressure and its rotation rate*," says Fred Taylor, a Venus Express interdisciplinary scientist. So, although Venus is similar in size to Earth, it is drastically different in the three parameters that drive its behavior.

There is another large unknown in the evolution of the atmosphere: the amount of lightning on the planet. Lightning drives the chemistry of an atmosphere by breaking molecules into fragments that can then join other fragments in unexpected ways. Nitric oxide formed in this manner is present in sufficient

quantities to be detected from Earth. "*There may be as much lightning on Venus as there is on Earth*," says Chris Russell, who was part of the magnetometer team that searched for, and found, lightning on Venus. Throughout its extended mission, Venus Express will continue collecting vital data to better understand the evolution of this fascinating planet.

ASTRONOMERS SAY MOONS LIKE OURS ARE UNCOMMON

The next time you take a moonlit stroll, or admire a full, bright-white moon looming in the night sky, you might count yourself lucky. New observations from the Spitzer Space Telescope suggest that moons like Earth's - that formed out of tremendous collisions - are uncommon in the universe, arising at most in only 5 to 10 percent of planetary systems. "*When a moon forms from a violent collision, dust should be blasted everywhere*," said Nadya Gorlova, lead author of a new study. "*If there were lots of moons forming, we would have seen dust around lots of stars - but we didn't*."

It's hard to imagine Earth without a moon. Our familiar white orb has long been the subject of art, myth and poetry. Wolves howl at it, and humans have left footprints in its soil. Life itself might have evolved from the ocean to land thanks to tides induced by the moon's gravity.

Scientists believe the moon arose about 30 to 50 million years after our sun was born, and after our rocky planets had begun to take shape. A body as big as Mars is thought to have smacked into our infant Earth, breaking off a piece of its mantle. Some of the resulting debris fell into orbit around Earth, eventually coalescing into the moon we see today. The other moons in our solar system either formed simultaneously with their planet or were captured by their planet's gravity.

Gorlova and her colleagues looked for the dusty signs of similar smash-ups around 400 stars that are all about 30 million years old - roughly the age of our sun when Earth's moon formed. They found that only 1 out of the 400 stars is immersed in the telltale dust. Taking into consideration the amount of time the dust should stick around, and the age range at which moon-forming collisions can occur, the scientists then calculated the probability of a solar system making a moon like Earth's to be at most 5 to 10 percent. "*We don't know that the collision we witnessed around the one star is definitely going to produce a moon, so moon-forming events could be much less frequent than our calculation suggests*," said George Rieke, a co-author of the study. In addition, the observations tell astronomers that the planet-building process itself winds down by 30 million years after a star is born. Like our moon, rocky planets are built up through messy collisions that spray dust all around. Current thinking holds that this process lasts from about 10 to 50 million years after a star forms. The fact that Gorlova and her team found only 1 star out of 400 with collision-generated dust indicates that the 30-million-year-old stars in the study have, for the most part, finished making their planets.

"*Astronomers have observed young stars with dust swirling around them for more than 20 years now*," said Gorlova. "*But those stars are usually so young that their dust could be left over from the planet-formation process. The star we have found is older, at the same age our sun was when it had finished making planets and the Earth-moon system had just formed in a collision*." For moon lovers, the news isn't all bad. For one thing, moons can form in different ways. And, even though the majority of rocky planets in the universe might not have moons like Earth's, astronomers believe there are billions of rocky planets out there. Five to 10 percent of billions is still a lot of moons. http://www.jpl.nasa.gov/news/news.cfm?release=2007-132

DISCOVERY OF STARS WITH CARBON ATMOSPHERES

Astronomers have discovered white dwarf stars with pure carbon atmospheres. These stars possibly evolved in a sequence astronomers didn't know before. They may have evolved from stars that are not quite massive enough to explode as supernovae but are just on the borderline. All but the most massive two or three percent of stars eventually die as white dwarfs rather than explode as supernovae.

When a star burns helium, it leaves "ashes" of carbon and oxygen. When its nuclear fuel is exhausted, the star then dies as a white dwarf, which is an extremely dense object that packs the mass of our sun into an object about the size of Earth. Astronomers believe that most white dwarf stars have a core made of carbon and oxygen which is hidden from view by a surrounding atmosphere of hydrogen or helium.

They didn't expect stars with carbon atmospheres. "*We've found stars with no detectable traces of helium and hydrogen in their atmospheres*," said astronomer Patrick Dufour. "*We might actually be observing directly a bare stellar core. We possibly have a window on what used to be the star's nuclear furnace and are seeing the ashes of the nuclear reaction that once took place*." Dufour, James Liebert and their colleagues published the results in the Nov. 22 issue of Nature.

The stars were discovered among 10,000 new white dwarf stars found in the Sloan Digital Sky Survey. The survey, known as the SDSS, found about four times as many white dwarf stars previously known. Liebert identified a few dozens of the newfound white dwarfs as "DQ" white dwarfs in 2003. When observed in optical light, DQ stars appear to be mostly helium and carbon. Astronomers believe that convection in the helium zone dredges up carbon from the star's carbon-oxygen core. Dufour developed a model to analyze the atmospheres of DQ stars as part of his doctoral research. His model simulated cool DQ stars, stars at temperatures between 5,000 degrees and 12,000 degrees Kelvin. For reference, our sun's surface temperature is around 5,780 degrees Kelvin.

When Dufour joined Steward Observatory in January, he updated his code to analyze hotter stars, stars as hot as 24,000 degrees Kelvin. "*When I first started modeling the atmospheres of these hotter DQ stars, my first thought was that these are helium-rich stars with traces of carbon, just like the cooler ones*," Dufour said. "*But as I started analyzing the stars with the higher temperature model, I realized that even if I increased the carbon abundance, the model still didn't agree with the SDSS data*," Dufour said. In May 2007, "*out of pure desperation, I decided to try modeling a pure-carbon atmosphere. It worked*," Dufour said. "*I found that if I calculated a pure carbon atmosphere model, it reproduces the spectra exactly as observed. No one had calculated a pure carbon atmosphere model before. No one believed that it existed. We were surprised and excited*."

Dufour and his colleagues have identified eight carbon-dominated atmosphere white dwarf stars among about 200 DQ stars they've checked in the Sloan data so far. The great mystery is why these carbon-atmosphere stars are found only between about 18,000 degrees and 23,000 degrees Kelvin. "*These stars are too hot to be explained by the standard convective dredge-up scenario, so there must be another explanation*," Dufour said. Dufour and Liebert say they these stars might have evolved from a star like the unique, much hotter star called H1504+65 that astronomer John A. Nousek, Liebert and others reported in 1986. If so,

carbon-atmosphere stars represent a previously unknown sequence of stellar evolution.

H1504+65 is a very massive star at 200,000 degrees Kelvin. Astronomers currently believe this star somehow violently expelled all its hydrogen and all but a very small trace of its helium, leaving an essentially bare stellar nucleus with a surface of 50 percent carbon and 50 percent oxygen. "*We think that when a star like H1504+65 cools, it eventually becomes like the pure-carbon stars*," Dufour said. As the massive star cools, gravity separates carbon, oxygen and trace helium. Above 25,000 degrees Kelvin, the trace helium rises to the top, forming a thin layer above the much more massive carbon envelope, effectively disguising the star as a helium-atmosphere white dwarf, Dufour and Liebert said. But between 18,000 and 23,000 degrees Kelvin, convection in the carbon zone probably dilutes the thin helium layer. At these temperatures, oxygen, which is heavier than carbon, has probably sunk too deep to be dredged to the surface.

Dufour and his colleagues say that models of stars nine to 11 solar masses might explain their peculiar carbon stars. Astronomers predicted in 1999 that stars nine or 10 times as massive as our sun would become white dwarfs with oxygen-magnesium-neon cores and mostly carbon-oxygen atmospheres. More massive stars explode as supernovae. But scientists aren't sure where the dividing line is, whether stars eight, nine, 10 or 11 times as massive as our sun are required to create supernovae. "*We don't know if these carbon atmosphere stars are the result of nine- or-10 solar mass star evolution, which is a key question*," Liebert said.

The astronomers plan making new observations of the carbon atmosphere stars at the 6.5-meter MMT Observatory on Mount Hopkins, Ariz., in December to better pinpoint their masses. The observations could help define the mass limit for stars dying as white dwarfs or dying as supernovae, Dufour said.

METHANE DRIZZLE ON SATURN'S MOON TITAN

Noted for its bizarre hydrocarbon lakes and frozen methane clouds, Saturn's largest moon, Titan, also appears to have widespread drizzles of methane, according to a team of astronomers. New near-infrared images from Hawaii's Keck Observatory and Chile's Very Large Telescope show for the first time a nearly global cloud cover at high elevations and, dreary as it may seem, a widespread and persistent morning drizzle of methane over the western foothills of Titan's major continent, Xanadu. In most of the Keck and VLT images, liquid methane clouds and drizzle appear at the morning edge of Titan, the arc of the moon that has just rotated into the light of the sun. "*Titan's topography could be causing this drizzle*," said Imke de Pater. "*The rain could be caused by processes similar to those on Earth: Moisture laden clouds pushed upslope by winds condense to form a coastal rain*."

Lead author Mate Adamkovics, noted that only areas near Xanadu exhibited morning drizzle, and not always in the same spot. Depending on conditions, the drizzle could hit the ground or turn into a ground mist. The drizzle or mist seems to dissipate after about 10:30 a.m. local time, which, because Titan takes 16 Earth days to rotate once, is about three Earth days after sunrise. "*Maybe only Xanadu has misty mornings*," he said.

Titan, larger than the planet Mercury, is the only moon in the solar system with a thick atmosphere, which is comprised mostly of nitrogen and resembles Earth's early atmosphere. Previous observations have shown that the entire moon is swathed in a hydrocarbon haze extending as high as 500 kilometers, becoming thinner with height. The south pole area exhibits more haze than elsewhere, with a hood of haze at an altitude between 30 and 50 kilometers.

Because of its extremely cold surface temperature - minus 183 degrees Celsius (-297 degrees Fahrenheit) - trace chemicals such as methane and ethane, which are explosive gases on Earth, exist as liquids or solids on Titan. Some level features on the surface near the poles are thought to be lakes of liquid hydrocarbon analogous to Earth's watery oceans, and presumably these lakes are filled by methane precipitation. Until now, however, no rain had been observed directly.

"*Widespread and persistent drizzle may be the dominant mechanism for returning methane to the surface from the atmosphere and closing the methane cycle*," analogous to Earth's water cycle, the authors wrote.

Actual clouds on Titan were first imaged in 2001 by de Pater's group and colleagues at Caltech using the Keck II telescope with adaptive optics and confirmed what had been inferred from spectra of Titan's atmosphere. These frozen methane clouds hovered at an elevation of about 30 kilometers around Titan's south pole.

Since then, isolated ethane clouds have been observed at the north pole by Cassini spacecraft, while both Cassini and Keck photographed methane clouds scattered at mid-southern latitudes. Also in 2005, the Huygens probe, build by the European Space Agency and released by Cassini, plummeted through Titan's atmosphere, collecting data on methane relative humidity. These data provided evidence for frozen methane clouds between 25 and 30 kilometers in elevation and liquid methane clouds - with possible drizzle - between 15 and 25 kilometers high. The extent of the clouds detected in the descent area was unclear, however, because "*a single weather station like Huygens cannot characterize the meteorology on a planet-wide scale*," said research astronomer Michael H. Wong.

The new images show clearly a widespread cloud cover of frozen methane at a height of 25 to 35 kilometers - "*a new type of cloud, a big global cloud of methane*," Adamkovics said - that is consistent with Huygens' measurements, plus liquid methane clouds in the tropopause below 20 kilometers with rain at lower elevations. Because earlier observers thought that the methane droplets in these clouds were too sparse to be seen, they referred to the frozen and liquid methane clouds as "sub-visible." "*The stratiform clouds we see are like cirrus clouds on Earth*," Adamkovics said. "*One difference is that the methane droplets are predicted to be at least millimeter-sized on Titan, as opposed to micron-sized in terrestrial clouds - a thousand times smaller. Since the clouds have about the same moisture content as Earth's clouds, this means the droplets on Titan are much more spread out and have a lower density in the atmosphere, which makes the clouds 'subvisible' and thus hard to detect*."

"*If all the moisture were squeezed out of Titan's clouds, it would amount to about one and a half centimeters (six-tenths of an inch) of liquid methane spread around Titan's surface*", Adamkovics said. This is about the same moisture content as some of Earth's clouds.

Since 1996, de Pater and colleagues have been using infrared detectors on the Keck telescopes to regularly monitor clouds and hazes on Titan. In past years, they have also used the VLT. The advantage of observing at infrared wavelengths is that Titan's haze is relatively transparent. At optical wavelengths, these haze layers form an impenetrable layer of photochemical smog.

By observing at different infrared wavelengths, scientists can probe different altitudes in Titan's atmosphere, depending on the strength of the methane absorption at that wavelength. Then, by using the methane absorption profile, they can pinpoint particular altitudes in Titan's atmosphere, allowing astronomers to see the surface and judge the altitude of methane clouds. Adamkovics first saw evidence of widespread, cirrus-like clouds and methane drizzle when analyzing data from a new instrument on the VLT - the Spectrograph for Integral Field Observations in the Near Infrared (SINFONI). Sharper images and spectra taken on April 17, 2006, by the OH-Suppressing Infra-Red Imaging Spectrograph (OSIRIS) on Keck II confirmed the clouds. Both instruments measure spectra of light at many points in an image rather than averaging across the entire image. By subtracting light reflected from the surface from the light reflected by the clouds, the researchers were able to obtain images of the clouds covering the entire moon.

"*Once we saw this in both data sets, we altered our radiative transfer models for Titan and recognized that the only way to explain the data was if there was liquid or solid methane in the atmosphere*," Adamkovics said. "*This is a big step in helping us understand the extent to which solid clouds and liquids are spread throughout Titan's atmosphere*."

HUBBLE ZOOMS IN ON HEART OF MYSTERY COMET

Hubble Space Telescope has probed the bright core of Comet 17P/Holmes which, to the delight of sky watchers, mysteriously brightened by nearly a million-fold in a 24-hour period beginning October 23, 2007.

Astronomers have used Hubble's powerful resolution to study Comet Holmes' core for clues about how the comet brightened. The orbiting observatory's Wide Field Planetary Camera 2 (WFPC2) monitored the comet for several days, snapping images on 29 Oct., 31 Oct. and 4 Nov. Hubble's crisp "eye" can see details as small as 54 kilometers across, providing the sharpest view yet of the source of the spectacular brightening.

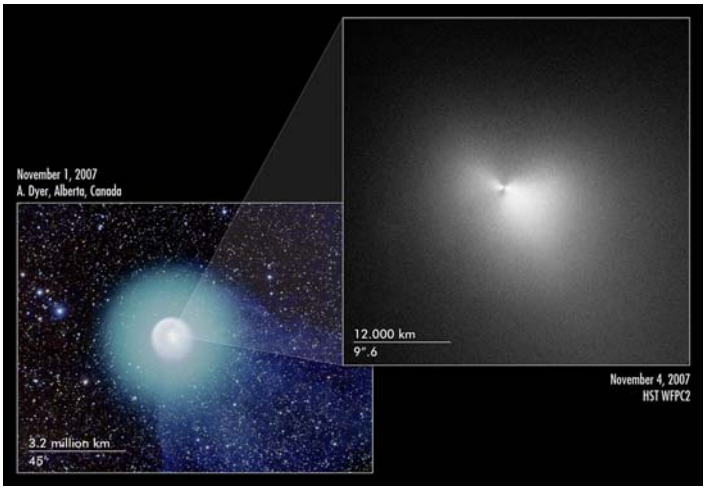
The Hubble image at right, taken on 4 Nov., shows the heart of the comet. The central portion of the image has been specially processed to highlight variations in the dust distribution near the nucleus. About twice as much dust lies along the east-west direction (the horizontal direction) as along the north-south direction (the vertical direction), giving the comet a "bow tie" appearance.

The composite color image at left, taken Nov. 1 by the amateur astronomer Alan Dyer, shows the complex structure of the entire coma, consisting of concentric shells of dust and a faint tail emanating from the comet's right side. The nucleus - the small solid body that is the source of the comet's activity - is still swaddled in bright dust, even 12 days after the spectacular outburst. "*Most of what Hubble sees is sunlight scattered from microscopic particles*," explained Hal Weaver who led the Hubble investigation. "*But we may finally be starting to detect the emergence of the nucleus itself in this final Hubble image*."

Hubble first observed Comet 17P/Holmes on June 15, 1999, when there was virtually no dusty shroud around the nucleus. Although Hubble cannot resolve the nucleus, astronomers inferred its size by measuring its brightness. Astronomers deduced that the nucleus's diameter was approximately 3.4 kilometers, about the distance between the Arc de Triomphe and the Louvre glass pyramid in Paris. They hope to use the new Hubble images to determine the size of the comet's nucleus to see how much of it was blasted away during the outburst.

Hubble's two earlier snapshots of Comet Holmes also showed some interesting features. On 29 Oct. the telescope spied three "spurs" of dust emanating from the nucleus while the Hubble images taken on 31 Oct. revealed an outburst of dust just west of the nucleus.

The Hubble images however do not show any large fragments near the nucleus of Comet Holmes, unlike the case of Comet 73P/Schwassmann-Wachmann 3 (SW3). In the spring of 2006 Hubble observations revealed a multitude of "mini-comets" ejected by SW3 after the comet increased dramatically in brightness. Ground-based images of Comet Holmes show a large, spherically symmetrical cloud of dust that is offset from the nucleus, suggesting that a large fragment broke off and subsequently disintegrated into tiny dust particles after moving away from the main nucleus. Unfortunately, the huge amount of dust near the comet's nucleus and the relatively large distance from Earth (240 million kilometers, or 1.6 astronomical units for Holmes versus 15 million kilometers, 0.1 astronomical units for SW3), conspire to make detecting fragments near Holmes nearly impossible right now, unless the fragments are nearly as large as the nucleus itself. http://www.spacetelescope.org/news/html/heic0718.html



FROM THE EDITOR'S TERMINAL

The Stargazer is your newsletter and therefore it should be a cooperative project. Ads, announcements, suggestions, and literary works should be received by the editor at least two weeks prior to the next upcoming scheduled EAS meeting. If you wish to contribute an article or suggestions to ***The Stargazer*** please contact Mark Folkerts by email or by telephone (425) 486-9733 or co-editor Bill O'Neil, at (774) 253-0747.

The Star Gazer
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In November's StarGazer:

**** ASTRO CALENDAR - SUN, MOON, AND PLANET VISIBILITY
**** OBSERVER'S INFORMATION
**** YOUNG ASTRONOMER'S CORNER
**** CONSTELLATION(S) OF THE MONTH – GEMINI AND TAURUS
**** 'MIRROR IMAGES' – GALAXY CLUSTERS
**** PLANETARY FOCUS – MARS APPROACHES OPPOSITION
**** HOLIDAY WISHES FROM THE HUBBLE SPACE TELESCOPE
**** CLIMATE AND EVOLUTION OF VENUS
**** ASTRONOMERS SAY MOONS LIKE OURS ARE UNCOMMON
**** ASTRONOMERS DISCOVER STARS WITH CARBON ATMOSPHERES
**** METHANE DRIZZLE ON SATURN'S MOON TITAN
**** HUBBLE ZOOMS IN ON HEART OF MYSTERY COMET

The next EAS Meeting is 3:00 P.M. Saturday December 1st at the Everett Public Library Auditorium – with 'Google Sky' presentation.