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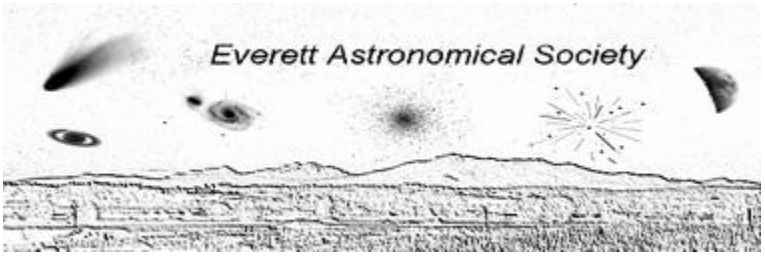

The Stargazer

December 2009

President: Mark Folkerts	(425) 486-9733	folkerts at seanet.com	***The Stargazer***
Vice President: James Bielaga	(425) 337-4384	jamesbielaga at aol.com	**P.O. Box 12746**
Librarian: Mike Locke	(425) 259-5995	lockemi at comcast.net	**Everett, WA 98206**
Treasurer: Carol Gore	(360) 856-5135	janeway7C at aol.com	
Newsletter co-editor: Bill O'Neil	(774) 253-0747	wonastrn at netway.com	
Web assistance: Cody Gibson		cgibson41 at austin.rr.com (change 'at' to @ to send email)	*See EAS website at:* http://everettastro.org

EAS BUSINESS…

NEXT EAS MEETING – SATURDAY JANUARY 16TH AT 6:00 PM, AT THE AURORA ASTRO PRODUCTS STORE

The December Dinner meeting was held December 12th at Alfys. January meeting will be on January 16th at Aurora Astro Products. Attending members will be eligible for a monthly door prize. (We have several new nice books to choose from).

The meeting will be at the Aurora Astro Products store in Silver Lake area (directions below) located at Silver Lake Plaza *11419 19th Avenue SE #A102, Everett, WA 98208*.

Map / Directions to store location – click the address link above:

If you are traveling northbound on I-5: Take exit #186/128th St. and go east - to the right on 128th St. continue until you come to Murphy's Corner/Intersection with Highway 527/19th Ave SE/Old Bothell-Everett Highway (all one in the same) and turn left/north. Follow until you see Silver Lake Plaza (red brick construction) on your right with the lake is on your left.

If you are traveling southbound on I-5: Take exit 187/Everett Mall Way and at the top of the exit's hill turn right following signs for Highway 527. At the light turn right following the signs for Highway 527. Then stay on Highway 527/19th Ave SE/Old Bothell-Everett Highway until you have Silver Lake on your right and the Silver Lake Plaza on your left. You may also continue down I-5 until exit 186 and turn left onto 128th then follow previous directions. If you have a problem you can always call 425-337-4384

★ STAR PARTY INFO ★

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

No more star parties scheduled until spring, due to the frequent wet, 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@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.
(call Jim Bielaga at (425) 337-4384 for info or check the EAS website.)
Members contact Jim Bielaga for scope borrowing.

Other Western US Star Parties This Season

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

EAS MEMBER NEWS

Other Member News…

2010 Officers – please welcome the new EAS officers !

Treasurer: (Jerry Galt) Collect club mail, and club dues, pay club bills, and maintain the club membership rolls.

Programs chairperson: (Ron Mosher) Contact potential speakers and invite them for monthly meeting, schedule the speakers, and introduce them at meetings.

Librarian: (Chris Dennis) Maintain the club books, movies, and software; and check materials out to members.

Astronomy Day chairperson: (Mike Kolzak) Reserve venues for annual Astronomy Day events, organize participants and publicity.

Star party organizer: (Ron Tam) Organize regular monthly suburban star parties March-November, and potentially other observing events as well.

Newsletter Co-editor #1: (Mark Folkerts) Organize and publish StarGazer newsletter on a monthly basis.

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.

* * *

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

THE PLANETARIUM

(LATE DECEMBER 2009 TO EARLY JAN 2010)

THE STARGAZER NEWSLETTER OF THE EVERETT ASTRONOMY SOCIETY -

- SUBMITTED BY JOHN W. GOERGER

POS1@EARTHLINK.NET

"Last month I discussed what a person should consider if they want to either give or receive a telescope for a holiday present. Since we still have a few days left before the end of the holidays you need to think though the idea of either giving someone a telescope as a gift or putting a telescope on your gift list. As I mentioned in my column last month, **one might consider a quality pair of binoculars**. Also if you are thinking of a gift related to astronomy you might consider a **subscription to either ASTRONOMY or SKY & TELESCOPE** magazine. For myself I use both but in my opinion, I think ASTRONOMY does a nice layout of the night sky for the month.

Believe it or not, there are astronomy hobbyists that do not get either publication and maybe you are one of them and have thought you would like to get either both or one of them as a gift as well. If you are not certain as to which one you or someone might like and use, go to your local Telescope or Bookstore and page though both magazines. With ASTRONOMY when you look at the layout of the night sky chart it shows the phase of the moon and what date. Then if you look just above that it shows you where the moon is in the sky on that date. It does this for the entire month, not just a few selected days. Also, it has in it the "Celestial Equator" (Earth's Equator), the Ecliptic and the positions of all the planets for that month.

SKY & TELESCOPE also shows some of this but not in the detail that ASTRONOMY does. However, both publications complement each other and if you are a member of an astronomy organization, like the Everett Astronomy Society, there is also a discount you receive for being a member of that club! Additionally, as a member there are other publications and benefits one can get depending on the astronomy club one joins. For those that are members you know this, and this might also be kind of a neat gift to present a friend, who might have an interest in astronomy; pay for their membership for one year in your local astronomy group! Many astronomy groups have telescopes that belong to the club and can be used by members for free!

Remember to check with you friend first, to make sure they are indeed interested in astronomy as a hobby, which if one is not careful, can get expensive! However, a person does not need a telescope to experience the wonders of the universe because now-a-days if one "surfs the net" you can see images of what is being observed and discovered by the various types of telescopes and related equipment used by astronomers!

In the first paragraph I mentioned **binoculars**. There are binoculars today that are "image stabilized" types. They are not cheap and start in price for at least $450 and more. With them, there is a button a person pushes and when that is pushed the object you are seeing will not move around because of your movements. Binoculars can be used for all sorts of activities (as I mentioned in this column last month) and one doesn't need to go to the image stabilizing system either. Many binoculars can be mounted on a field tripod and then what a person is observing is stable. Also, the tripod can be used as a camera platform when the binoculars are not being used! Stay away from binoculars with red color on the front lens! That is a marketing gimmick, and has no bearing on the use of quality binoculars; in fact decreases the quality of them!

If binoculars are to be the chosen gift, here are a few things to look for. Hold them up in front of you but do not put them up against your eyes as if you are looking through them. Look at where your eyes will be looking them and if you see a "square" surrounding the image, those are very cheap optics! If there is a slight squaring, that is not bad and ideally if the image is surrounded by an oval of light; that is a sign of a quality pair of binoculars. However, those that have that, tend to be a bit pricy, so beware.

Also another trick is to hold them in front of you and using both eyes observe say a stone fence or something that is linear---does the image appear continuous or does it appear to "jump" as the image goes from one eyepiece to the other; in other words is the image straight or does one side appear higher than the other? If it does, that might mean the optics in the binoculars are out of alignment. There are other things a person might look for, and if you have questions always remember club members are always eager and willingly to help out with any questions you might have about any astronomy equipment.

* * *

There are approximately 5 more space shuttle missions to be completed, and sometime in late 2010 NASA will shut down its operation. I have written about this before and again I want to point out, this makes no sense. All I can do is to give you facts, information and in some cases conclusions based on that data; it is up to you to decide whether or not you chose to do something about it. If NASA does stop shuttle operations, later this year, the United States Government's space agency, NASA will not be able to send and orbit human beings into earth orbit or to the International Space Station, which for the most part was paid for by American Taxpayers.

There is **VIRGIN** GALALATIC but that is a private enterprise of which is only capable of sub-orbit flights and unable to fly to the ISS. For getting American Astronauts to the ISS, the U.S. will have to rely on manned Russian Spacecraft as they will be the only game in town with the ability of reaching the ISS orbital altitude of over 220 miles above the earth. It is at least 4-5 yrs and possibly longer before the U.S. will have the launch systems which could send American Astronauts to the ISS. Also, what if a major component of the ISS were fail? At present, only the space shuttles are the only means of delivering large components to that orbiting outpost. Even Russian launch vehicles cannot carry some of the major and even some minor sections of the ISS, to the ISS.

If on the other hand, the Federal Government were to give NASA the funds needed to keep the Space Transportation System active; say having the ability of being able to launch 1-2 shuttle vehicles per yr, until the new generation of manned space vehicles came on-line; that could be NASA's life-line for ferrying equipment and astronauts to the ISS, if needed.

If you are ever at a used bookstore, see if you can find the book entitled ENTERPRISE. It was published in ~1976 and the author brings up the cost of the Space Transportation System. NASA agreed to the following in 1972: The total cost of the system was pegged at $7.5 billion, with a cost overrun estimated to be 20% ($1.5 billion, for a total cost (1972 dollars) of $9 billion. Of the $7.5 billion, $5.22 billion was allocated to the development and construction of 5 space shuttles; the remainder of the total program cost (minus the 20% cost overrun estimate, at that time) was ~$2.28 billion. That amt was for developing all related activities to the space shuttle system; launch pads, recovery site, equipment, personnel etc.

Then, came double digit inflation in the 1970s: NASA never got any added funds because of this; basically NASA's budget for the shuttle system was cut in half because of inflation, and even with the additional 20% agreed too, that also was cut to 10% (buying power). So, actually NASA built the shuttle fleet on half the budget it had agreed to and neither Congress nor any of the Presidents since, increased NASA funds for space shuttle operations. As such, over the years, NASA has had to "borrow" from other funds to continue shuttle operations. Without the Space Shuttles there would be no HUBBLE SPACE TELESCOPE, no INTERNATIONAL SPACE STATION and other space related achievements!

* * *

Recently there are quite a few articles appearing in science magazines discussing the finding of **life beyond Earth in our star system**, and the discovery of additional planets in other star systems and the possibility of earth-type planets in those systems. Sometimes when one reads those articles, it seems the authors might cause the reader to become confused. When writing (discussing) life on other worlds beyond our solar system, the writers sometime mix the idea of life originating on those worlds, then go on about how we might communicate with them.

There is BIG difference between some microbe evolving on a planet and a species that has built a technological society where the building of radio telescopes is the norm! There could be lots of intelligent societies, living on other planets, orbiting other stars, but those societies could be on the technological level of the Roman Empire (couldn't have a useful chat with them, as they don't have radio telescopes yet). Also, to understand how life evolves a person has to understand chemical evolution. LIFE whether a person likes this or not, is based on the chemistry of CARBON. Look at the Periodic Chart of Chemicals and all the elements that come before CARBON cannot create the complex chain molecules that CARBON can!

As you look at that chart understand as well, there is more CARBON in the present Universe than the elements that come after it! It follows, there are more of the elements in the Universe that come before CARBON, but CARBON, as mentioned above has qualities that the elements that come before it, do not have. So, if you are looking for LIFE, you have to find a region where the carbon supply is abundant! Now, within our solar system there is growing excitement that life may indeed exist on a number of worlds and moons. The problem is; how will we know if that life evolved, or got started there in the first place?

Over the years it has been discovered that material has been exchanged between the various bodies of the solar system. Maybe life first evolved on Mars; comets and/or asteroids impacted Mars, sending that Martian stuff, loaded with microbial life (viruses and/or related organic material), into space and then some of it came to Earth and other celestial bodies in our solar system. Or, maybe Earth-borne life forms were blasted into space by impacts on earth, sending that material to other bodies that orbit our star (could the "organics of life" formed during comet formation)? There is also a possibility that life-material may have come from deep space; from other star systems and eventually was deposited onto the planets and their satellite bodies, where that life-material found the conditions to be beneficial, it thrived. As the Great Science Fiction Author Ray Bradbury as said; "We are the Universe looking back at its self."

As you know I was also writing a column for the Orange County Space Society's newsletter **OC SPACE**, called '**The Planetarium'**. Because of a series of situations, the OCSS is in hibernation for at least one year, (all of 2010). As such, my column will continue to appear in this newsletter until cooler heads prevail, and decide that maybe my ideas should not be exposed to such innocent minds, such as yours! Since this column is here, I am going to mention a bit about what is visible and any near happenings in the night and day sky, assuming we have a clear sky at night, here in the Pacific Northwest!

* * *

For the remaining part of December 2009, the planet **Mercury**, in the southwest at sunset is shinning at an apparent visual magnitude -0.6 and by the 18th is at its highest in altitude (~8 degrees) and at its Greatest Elongation from the Sun (angle of separation) of approximately 20 degrees east of the sun, 30 minutes after sunset. Assuming the evening sky is clear, a crescent moon is 6 degrees to its left. Since the atmosphere is cold, the air turbulence should be mild and a view of Mercury though a telescope would reveal a disk with the planet having a waning disk (about ½ lit) on the 15th and an angular diameter of 6.2 arc seconds (6.2").

I realize that many members of EAS know angular size, but I try to write for those who may not know what some of these terms and symbols mean. One degree in the sky is about two full moons/the sun and the moon take about ½ of a degree in the sky. One degree can be divided equally into 60 arc minutes (60') and each arc minute (1') is equal to 60 arc seconds of angle (60"). So, when discussing the diameter of a planet or even a star, or the separation of planets and their moons and distances between binary star systems, most astronomy articles mention the "angular size" (diameter/distance) the celestial object takes up in the sky.

At the end of December 2009, Mercury fades from the western evening sky, setting in the west. However by January 13th, 2010 you might see it rise in the predawn hours, in the southeast, about 7 degrees above the horizon, 30 minutes before sunrise! According to my sources, one has to have a flat horizon, clear sky and you should see a thin crescent

moon, 5 degrees south of Mercury! More on this swiftest of all planets in our star system, next month,

Excluding the moon, **Jupiter** is the brightest celestial beacon you will see in the cold winter December night sky. Brightly, at a -2.2 located in the southwestern twilight sky, you cannot miss it as there is nothing to rival its glow. As soon as you see it, again hoping for a clear night; get your telescope aimed at this jewel of the winter sky. While observing it, you will see its inner moons; the Galilean satellites; as they are sometimes referred to, as Galileo was the first person that first aimed a telescope at this object and discovered its moons orbiting this king of the planets. This coming January 7th marks the 400th Anniversary when Galileo discovered, Io, Europa and Callisto, on that month and date in the year of 1610, with Ganymede located 6 days later.

The planet has an angular size of 36.3" on the 15th. By the 19th you will be able to see both Jupiter and Neptune, though a telescope separated by only 34" (arc seconds)! This is a real treat to be able to see two planets that are hundreds of millions of miles from each other and see them within the same field of view (again hoping for a clear dark sky). By January 2010, Jupiter will be lower toward the southwestern horizon and will set about 4 hours after the sun. So, make sure, if the sky is clear to get in some telescope viewing time of this wonderful and magnificent planet.

With **Neptune**, at a 7.9 apparent magnitude one cannot see this planet without an optical aid (telescope, binoculars). So, when you have Jupiter in the eyepiece, starting with a low power eyepiece you will see Neptune on the 19th. Neptune's diameter is about 2.2" and because Neptune is much farther away, it glows according to ASTRONOMY magazine (12/2009) 10,000 times fainter than Jupiter! SKY & TELESCOPE (12/2009) mentions this closest in apparent angular size will be the last one for at least 13 yrs, for the two of them. From the 15th through the 25th the two planets will be separated by about one degree. Also some more about Neptune next month!

I generally write about the planets can a person can see visually, without optical aid. **Uranus** is in the evening sky at a 5.9 visual. However, most people could look straight at this planet and not even know they are looking at Uranus! The data I have tells me that it is to Jupiter's upper left and sets 2 hrs after Jupiter. It has a pale-green color when observed through a telescope and has diameter of 3.4"

Mars is finally going to start giving a good showing of its self! On the first it was rising at 10 P.M. and at the end of December it rises around 8 P.M. local. The best seeing conditions is close midnight and after, even though it might be a bit COLD outside (BRRRR). At present it is around -0.3 and gradually increases in visual brightness! In angular size it grows from 10" to 12.7, and hopefully there will be some clear nights to do some observing of it. Mars seems to move "eastward" with respect to the stars, in that it gradually changes position with the stars that are in the background, from night to night.

By the 21st of December it will appear to "stop" and start to drift or what is called "Retrograde", that is it will start to appear to move "westward" with respect to the background stars. This "behavior" by the way, use to "drive the ancients up their pyramids". They could not understand why one of their "gods" was going backwards at times? Can you figure out what is going on with Mars? Also more on this "God of War" planet next month!

Saturn our ringed friend is showing up! It rises around 11:30 P.M local at month's end, trailing Mars! Its brightness is compared to that of the star Spica which is around a +1.0. Saturn has kind of a butterscotch color to its self. During the month of December its diameter size increases from 17" to 18". The rings are opening slowly as their tilt, with respect to Earth goes to around 4.9 degrees. The rings themselves span an angle of almost 39".

The Winter Solstice, the shortest day of the year occurs on December 21, 2009, for the Northern Hemisphere of the Earth! Believe it or not the Earth is actually closer to the sun on January 2 2010 at a mere 91.4 million miles from the sun (Perihelion). When it is the First Day of Summer for those of us who inhabit the Northern Hemisphere of the Earth, Earth is at its farthest distance from its star, the Sun!

The moon is a fun item to look at! On the 16th of December the moon is called a New Moon, which means the moon is in the same side of the sky as the sun. If you were an astronaut and were in orbit about the moon on that day, you would see the backside (farside) of the moon, which we never see from earth, FULL! By the 20th the moon is at a distance of 252,109 miles, at its (apogee) farthest point in December from the Earth, and would appear as a thin Waxing Crescent. A First Quarter Moon shows in the evening sky of the 24th of December and a Full Moon greets us New Year's Eve on the 31st!

At a distance of 222,875 miles on the 1st of January 2010, the moon is now at its closest distance to our planet-New Year's Day! The moon is near Mars, about 7 degrees south of it. The Last Quarter Moon happens on the 7th, and comes to within 5 degrees south of Mercury on the 13th. The moon becomes a NEW MOON (no moon visible) on the 15th of January and by the 16th the moon is now at apogee (farthest from the earth) at a distance of 252,547 miles---you would think it would make up its mind!). The moon visits Jupiter on the 23rd within 5 degrees north of that planet. First Quarter happens on the 23rd of January. More about that yellow whitish orb next month!

As mentioned in last month's column, may this coming NEW YEAR 2010 be a shinning new beginning for all of humanity and that the problems we think are higher than the highest mountain, turn out to be just a mole hill! **AD ASTA! TO THE STARS!**"

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 a club officer to borrow or donate any materials, or **contact Jim Bielaga at Aurora Astro**. 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

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"

>> 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. <<

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"*Your Northern Light in the Astronomy Business*"
Over 37 product dealerships, and growing
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www.auroraastro.com
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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

$$ - Financial Health - $$

The club maintains a $750+ balance. We try to keep approximately a $500 balance to allow for contingencies. .

Club Scopes

Scope	Loan Status
13-inch thin-mirror Dob	Finishing Rehabilitation
10-inch Ward Dobsonian	Available
10-inch Sonotube Dobsonian	Available
8-inch Dobsonian	Available

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

Astro Calendar for 2009

January 2010

Jan 03 - Quadrantids Meteor Shower Peak
Jan 04 - Earth At Perihelion (0.983 AU From Sun)
Jan 15 - Annular Solar Eclipse, Visible in Africa, India & China
Jan 16 – EAS Meeting at Aurora Astro – 6:00 PM
Jan 20 - Buzz Aldrin's 80th Birthday (1930)
Jan 27 - Mercury At Its Greatest Western Elongation (25 Degrees)
Jan 28 - Mars Closest Approach To Earth (0.664 AU)
Jan 29 - Mars at Opposition

February 2010

Feb 14 - Chinese New Year
Feb 22 - Asteroid 4 Vesta Closest Approach To Earth (1.411 AU)

March 2010

Mar 14 - Daylight Saving - Set Clock Ahead 1 Hour (United States)
Mar 20 - Vernal Equinox, 17:32 UT
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 22 - Lyrids Meteor Shower Peak
Apr 24 - Astronomy Day

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.

Observer's Information…

Lunar Facts

Jan 07	Last Quarter Moon

Jan 15	New Moon
Jan 23	First Quarter Moon
Jan 30	Full Moon
Feb 05	Last Quarter Moon
Feb 14	New Moon
Feb 22	First Quarter Moon
Feb 28	Full Moon
Mar 07	Last Quarter Moon
Mar 15	New Moon
Mar 23	First Quarter Moon
Mar 30	Full Moon

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

Object	*Rises*	*Sets*	*Con*	*Diam.*	*Mag*
Sun	***07:57 am***	***16:31***	***Sag***	***30'***	***-27.5***
Mercury	**07:55 am**	**16:50**	**Sag**	**10"**	**+4.7**
Venus	**07:55 am**	**16:17**	**Sag**	**10"**	**-3.9**
Mars	**19:10**	**10:17 am**	**Leo**	**13"**	**-0.8**
Jupiter	**10:11**	**20:16**	**Cap**	**35"**	**-2.1**
Saturn	**23:30**	**11:41 am**	**Vir**	**18"**	**+0.8**
Uranus	**11:04 am**	**22:39**	**Aqr**	**03"**	**+5.9**
Neptune	**10:03 am**	**20:05**	**Cap**	**02"**	**+8.0**
Pluto	**06:52 am**	**16:08**	**Sag**	**--**	**+14.1**

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

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

CONSTELLATIONS OF THE MONTH –

CANIS MAJOR: Canis Major (CMa), or the "Greater Dog" as literally translated, is a well-known and interesting constellation which borders on many of our familiar winter star groupings, including Monoceros, Puppis, Lepus, and Columba. Asterisms associated with this constellation include the "Winter Octagon", the "Winter Oval" and the "Winter Triangle". The central point of Canis Major is at RA=6h47m, and Dec.= -22 degrees; its overall brightness is ranked among the constellations at 6th, with a size-related calculation of almost 15 (14.733) visible stars for each 100 square degrees of constellation area. Canis Major also contains 56 visible stars brighter than magnitude 5.5. Its midnight culmination date is January 2nd, which makes it well placed for winter observing; the grouping has no associated meteor showers and one Messier object (M-41). This constellation ranks 43rd in size among the constellations (taking up about 380 square degrees (or about 0.921% of the sky), and is completely visible from latitudes S of +57 degrees and completely invisible from latitudes N of +79 degrees. The solar conjunction date of this constellation is January 4th. Sirius (alpha CMa) has the brightest apparent magnitude of any star in the nighttime sky, appearing 4 times brighter than Vega and 25 times brighter than Polaris. Sirius has an absolute magnitude of +0.7, which makes it 36 times more luminous than the Sun. Sirius is also a double star: its companion (Sirius-B, also known as "the Pup") was the first white dwarf ever discovered (by Alvin Clark in 1862, while testing a new telescope objective lens; however, its existence was suspected by German astronomer F.W. Bessell as early as 1834). The first appearance of Sirius in the eastern morning sky each year (the heliacal rising) was the major astronomical event in ancient Egypt.

This occurrence marked the impending flooding of the Nile River each year (agriculturally important because of the deposition of rich silt layers over wide areas). The legends of CMa are as follows: Canis Major and Minor were the hunting dogs of Orion, with Canis Major being so swift that it could outrun and overtake any animal. The ancient Egyptians saw the star Sirius in CMa as the god Anubis, with a man's body and the head of a jackal. Sirius became known as the "Dog Star", and the hot days of summer between July and early September became known as the "Dog Days" of summer. Canis Major contains some interesting celestial objects. Sirius, while not one of the Galaxy's most luminous stars, appears as the brightest because it also happens to be the fifth closest at 2.7 parsecs. It is an A-1 type main sequence star, measuring 1.8 solar diameters across, and it contains almost 2.5 times the Sun's mass. With an apparent magnitude of –1.4, only Venus, Jupiter, Saturn, and Mars can outshine Sirius in the night sky; it is also interesting to realize that Sirius is over 500,000 times farther away from us than our Sun. Sirius B, the white dwarf companion of Sirius, shines at magnitude 8.7, but lies only about 9" away from Sirius, which easily overpowers it from being visualized in average backyard scopes (although with proper technique and instrumentation, it has been done). Messier-41 is a beautiful open cluster located within the confines of Canis Major. It lies about 4 degrees south of Sirius, and shining with the light of a 5th magnitude star, it measures 32' across. M-41 contains about 100 stars of varying colors and temperatures, the brightest of which is about 7th magnitude. The brightest are G- and K-type giant stars, followed by several bright blue B-type giants with high intrinsic luminosities. This beautiful open cluster lies about 750 parsecs away, and it has a density of about 1.1 stars per cubic parsec. Other well-known open clusters in Canis Major are NGC-2354 and NGC-2362 (the latter surrounds the bright star Tau Canis Majoris, and is one of the youngest known galactic clusters, probably less than 1,000,000 years old). Still other open clusters in this region include NGC-2360, NGC-2374, and NGC-2383, NGC-2204, and NGC-2243. One of the most massive and also luminous stars known is the unusual variable star UW Canis Majoris, an eclipsing binary consisting of two stars that orbit each other in about 4.5 days. These two stars are flattened into elliptical shapes by the mutual tug of gravity, as the distance between them is a mere (in astronomical terms) 17 million miles. From Earth, the distance to this system is 1.0 kiloparsec, making its luminosity 16,000 times that of the Sun!! Other interesting objects in Canis Major include NGC-2359 (emission nebula), IC-468 (emission nebula), and IC-2165 (magnitude 12.5, 8" across planetary nebula). Canis Major also contains two galaxies of interest: NGC-2207 (spiral 12.3 magnitude galaxy, measuring

2.5' x 1.5' across) and NGC-2217 (SBa-barred spiral, 12th magnitude, measuring 4.0' x 3.0' across). The latter is shown in at least an 8-inch reflector on a good seeing night as a dim, fairly even halo of light surrounding a distinctly brighter, very condensed core. Try to get out this winter to do some observing in this very interesting and well-known constellation.

AURIGA: "The Charioteer". This very famous and easily recognized constellation (the "upside-down crown") borders on the constellations of Camelopardalis, Gemini, Lynx, Perseus, and Taurus. It ranks 43rd in overall brightness, containing 47 visible stars brighter than magnitude 5.5. Its central point is located at RA=6h01m and Dec.= +42 degrees. It is completely visible from latitudes North of -34 degrees, and completely invisible from latitudes South of -62 degrees. This constellation ranks 21st in overall size, taking up 657.44 square degrees, or 1.594% of the sky. Auriga has several bright, named stars, including the famous and beautiful Capella (alpha; a yellow giant spectroscopic binary with a high lithium content), the sixth brightest in all the sky (its apparent magnitude is 0.08; absolute magnitude is 0.1; and distance is 45 light years). Other bright, named stars in Auriga include Almaaz and Maaz (epsilon; an eclipsing binary system) and Hasseleh (iota). Auriga contains, or is part of, more than one asterism, including Capella and "the Kids", and the Winter Oval, and has one known meteor shower (the Aurigids), which peak on September 1. This easy to spot fall/winter constellation has three well known Messier objects (M36, 37, and 38), all of which are beautiful open (or galactic) clusters. The midnight culmination date of Auriga is December 21st. An interesting fact about epsilon Aurigae is that approximately every 27 years, the system undergoes an eclipse which darkens it by almost one full magnitude, for nearly two years in duration. The most probable explanation for this phenomenon is that the system has a large, darker flat disk companion, (which is probably a pre-stellar cloud of matter), passing in front of the system every 27 years. The next eclipse is expected to start in January, 2010. Take a pair of good binoculars, or your telescope, and try to enjoy the wonders of beautiful Auriga at least once every winter.

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 it's beautiful and interesting neighbors, on the next clear night.

MONOCEROS: Monoceros, or the Unicorn, is an interesting constellation which borders on many of our familiar winter star groupings, including Orion, Canis Major and Minor, Gemini, Hydra, Lepus, and Puppis. The constellation's central point is at RA=7h01m, and Dec.=+0.5 degrees; its overall brightness is listed at a magnitude of 7.476, and it contains 36 visible stars brighter than magnitude 5.5. Its midnight culmination date is January 5th, which makes it well placed for winter observing, and the grouping has one associated meteor shower (the Monocerotids), which peak on or about December 10th. This constellation ranks 35th in size, and is completely visible from latitudes +79 degrees to –78 degrees. Monoceros also contains one Messier object, M-50, which is a magnitude 6.3 galactic (open) cluster. Perhaps more famous than the Messier object however, are a trio of objects well known to many astronomers. The first is Plaskett's Star, which is in reality a pair of extremely massive stars, among the most massive pairs yet identified. This duo sits almost directly on the Galactic Equator, and the total mass of the system is more than 100 times that of the sun. Also in Monoceros is "Hubble's Variable Nebula", a fan-shaped reflection nebula which has been seen to undergo changes in brightness, size, and shape, (but no regular period of variability has been found for the nebula). It is illuminated by the star R Monocerotis, a very young infrared-emitting stellar object surrounded by a disk of dust which is ejecting a bi-polar flow; this flow causes the variability in the nebula. Lastly, and most famous of all, is the beautiful emission nebula known as the Rosette. It surrounds an open cluster of stars containing the star 12 Monocerotis, and is an H-II region heated and ionized by this centrally located group of hot young stars. Try to enjoy the beauties of this well-placed constellation during these winter months; your time will be well spent.

YOUNG ASTRONOMER'S CORNER

TOPIC: THE HOLIDAY STARS: With the advent of the end of the year, and the Christmas, Hanukkah, and New Year holidays, this period gives many people pause to reflect and wonder at their lives and the world around us. If the weather is clear, and you get the chance to look up at the night sky this holiday season, here's a few interesting facts to ponder:

★★ What was the "Christmas Star"?: The "Christmas Star", or the "Star of Bethlehem" is a well known phenomenon that, according to several traditions, guided the Wise Men to the birth site of Jesus Christ in Bethlehem. But was it truly a star? There have been many theories as to exactly what it was. According to one source, Jesus was very likely born somewhere between the years 7 and 4 B.C. During this time, we know that a beautiful, rare, and spectacular event occurred. On the western horizon, Jupiter, Saturn, and Mars were extremely close together (a phenomenon called a "conjunction"), and must have, together, burned very brightly in the Western sky. This event involving these three planets in this configuration is expected to happen only once every 800 years!! Additionally, these bright planets probably sat just south of the bright stars of the Great Square of Pegasus. This is the event that most current astronomers feel was actually the bright "Star of Bethlehem". It truly must have been an awe inspiring apparition (just as such an event would be today), but in those days, many more people were likely to assign a religious significance to it, as opposed to a purely scientific one.

Another event that is a beautiful Christmas coincidence (that has also been assigned a religious significance, but much more so in the past), involves the constellation Cygnus. Cygnus, or the "Swan" actually looks like a cross, and the cross has spiritual significance in many cultures and religions. But did you know, that on Christmas Eve, the cross almost stands straight up and down, as the "Swan" dives down below the western horizon? At other times of the year as Cygnus makes its way across the heavens, the Cross or Swan is in various positions of flight with respect to the remaining stars in the sky. Although the "cross" configuration of the constellation is easy to see all year long, it is only

at this time of year that the constellation Cygnus, or the Northern Cross, truly looks like a right-side-up, standing cross.

Finally, there are at least two important religious holidays this time of year: one for Christians (Christmas), and one for Judaism (Hanukkah). Why this time of year? One reason besides the more traditional ones may be that ancient cultures may have been trying to "replace the light" from the sun that is much weakened this time of year. This is the time of the winter solstice, when the sun is furthest south, and sunlight is at its weakest for people like us who live north of the equator. Since the "eight candles of Hanukkah", and all the Christmas lighting displays occur at this time of year, in addition to the religious significance, were these religions also trying to symbolically "replace the light" lost from the sun after it had traveled south? If you have the time during this busy season, and the nights are clear, take a minute to reflect on the

"Planetary Focus"; Astronomy and Telescope "Lingo"; "Mirror Images"; and "Astronomy Fun Facts" columns will all return in January after the Holidays - for one Final Time by the Current Newsletter Co-Editor. See you then!!

Astronomical Notes -- On & Off the Web...

Scientists Discover Fog on Titan

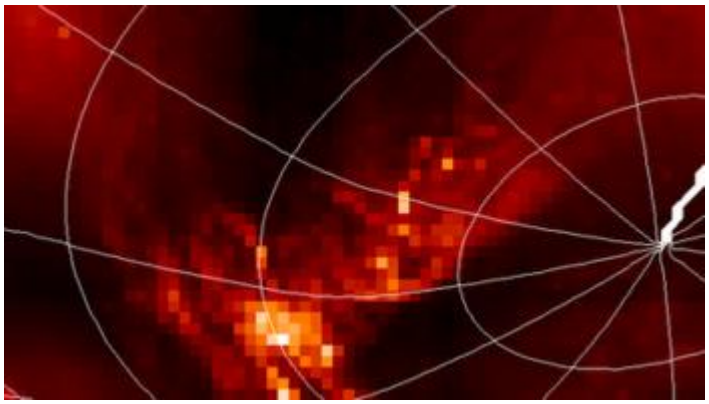
Saturn's largest moon, Titan, looks to be the only place in the solar system - aside from our home planet, Earth - with copious quantities of liquid (largely, liquid methane and ethane) sitting on its surface. According to planetary astronomer Mike Brown, Earth and Titan share yet another feature, which is inextricably linked with that surface liquid: common fog. The presence of fog provides the first direct evidence for the exchange of material between the surface and the atmosphere, and thus of an active hydrological cycle, which previously had only been known to exist on Earth. In a recent talk, Brown, the Richard and Barbara Rosenberg, detailed evidence that Titan's south pole is spotted "more or less everywhere" with puddles of methane that give rise to sporadic layers of fog. (Technically, fog is just a cloud or bank of clouds that touch the ground).

The researchers made their discovery using data from the Visual and Infrared Mapping Spectrometer (VIMS) onboard the Cassini spacecraft, which has been observing Saturn's system for the past five years. The VIMS instrument provides "hyperspectral" imaging, covering a large swath of the visible and infrared spectrum. Brown and his colleagues - including undergraduate students Alex Smith and Clare Chen, who were working with Brown as part of a Summer Undergraduate Research Fellowship project - searched public online archives to find all Cassini data collected over the moon's south pole from October 2006 through March 2007. They filtered the data to separate out features occurring at different depths in the atmosphere, ranging from 20 kilometers (12.4 miles) to .25 kilometers (820 feet) above the surface. Using other filters, they homed in on "bright" features caused by the scattering of light off small particles - such as the methane droplets present in clouds. In this way, they isolated clouds located about 750 meters (less than a half-mile) above the ground. These clouds did not extend into the higher altitudes into the moon's troposphere, where regular clouds form. In other words, says Brown, they had found fog.

"Fog - or clouds, or dew, or condensation in general - can form whenever air reaches about 100 percent humidity," Brown says. "There are two ways to get there. The first is obvious: add water (on Earth) or methane (on Titan) to the surrounding air. The second is much more common: make the air colder so it can hold less water (or liquid methane), and all of that excess needs to condense." This, he explains, is the same process that causes water droplets to form on the outside of a cool glass. On Earth, this is the most common method of making fog, Brown says. "That fog you often see at sunrise hugging the ground is caused by ground-level air cooling overnight, to the point where it cannot hang onto its water. As the sun rises and the air heats, the fog goes away." Similarly, fog can form when wet air passes over cold ground; as the air cools, the water condenses. And mountain fog occurs when air gets pushed up the side of a mountain and cools, causing the water to condense. However, none of these mechanisms work on Titan.

The reason is that Titan's muggy atmosphere takes a notoriously long time to cool (or warm). "If you were to turn the sun totally off, Titan's atmosphere would still take something like 100 years to cool down," Brown says. "Even the coldest parts of the surface are much too warm to ever cause fog to condense."

Mountain fog is also out of the question, he adds. "A Titanian mountain would have to be about 15,000 feet high before the air would get cold enough to condense," he says. And yet the tallest mountains the moon could possibly carry (because of its fragile, icy crust) would be no more than 3000 feet high. The only possible way to make Titanian fog, then, is to add humidity to the air. And the only way to do that, Brown says, is by evaporating liquid - in this case, methane, the most common hydrocarbon on the moon, which exists in solid, liquid, and gaseous forms. Brown notes that evaporating methane on Titan "means it must have rained, and rain means streams and pools and erosion and geology. The presence of fog on Titan proves, for the first time, that the moon has a currently active methane hydrological cycle."

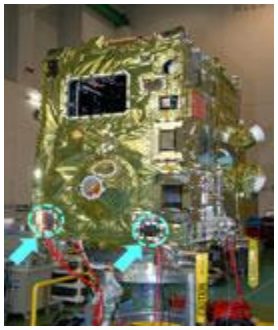


Fingers of fog can be seen moving across the south pole of Titan in this image constructed by Mike Brown and his colleagues using data from the Cassini spacecraft. The fog shows regions where pools of liquid methane sitting on the surface of Titan are evaporating into the atmosphere. After a long summer of frequent clouds and rain at the south pole, it appears in this late summer image that evaporating liquid methane covers large areas of the pole.[Credit: Mike Brown/Caltech]

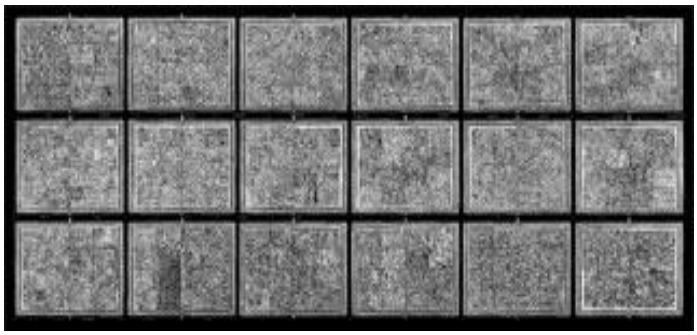
The presence of fog also proves that the moon must be dotted with methane pools, Brown says. That's because any ground-level air, after becoming 100 percent humid and turning into fog, would instantly rise up into the atmosphere like a giant cumulus cloud. "The only way to make the fog stick around on the ground is to both add humidity and cool the air just a little," he explains. "The way to cool the air just a little is to have it in contact with something cold, like a pool of evaporating liquid methane." http://www.mr.caltech.edu/press_releases/13314 For more information about the discovery, go to Brown's blog at http://www.mikebrownsplanets.com/2009/08/fog-titan-titan-fog-and-peer-review.html.

Send a Message to Venus, on Japan's Akatsuki Orbiter Mission

JAXA says - *"We will deliver your message to Venus" - the Akatsuki message campaign deadline for accepting messages has been extended to January 10th. The Japan Aerospace Exploration Agency (JAXA) has been holding the "Akatsuki Message Campaign" in order to enhance people's interest in Venus, and to make people familiar with the Venus Climate Orbiter AKATSUKI, which is scheduled to be launched by the H-IIA Launch Vehicle in 2010. We will accept your entries until January 10, (Sunday) 2010. (The deadline was originally December 25, 2009).* ***How to send a message via the Internet*** *- We are accepting messages from individuals only through the Internet English website: http://www.jaxa.jp/event/akatsuki/index_e.html "* You will be able to download a "certificate of participation to the campaign" when you send your name and/or message. It will be sent and shown only once, so if you want to keep it, please click the certificate to download it. *"Only a name (without a message) is also acceptable. You can send a message in Japanese characters (Hiragana, Kanji, and Katakana) as well as using numbers and/or Roman letters. However, some letters (such as half-sized Katakana) or some PC specific letters may not be properly encoded on our side. Please refrain from sending such letters."*



Location of Display Plates



Aluminum Display Plate with miniature images.

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Background on Venus Climate Orbiter Akatsuki

Venus is the brightest star, apart from the sun and moon, in the all-sky. It has been well-known among the Japanese as the "morning bright star" and "evening bright star" since ancient times. In the West, its shining beauty is explained in its name Venus, the goddess of beauty.

Venus comes closest to the Earth, and the two planets are often considered as "sister planets", as they were created in a similar process about 4.6 billion years ago. However, the environment of Venus is quite different from that of the Earth. As its atmosphere mostly consists of carbon dioxide, which causes an intense greenhouse effect, Venus has become a red-hot planet with a temperature of 460 C degrees. Although Venus has little rotation, sulfur clouds move around Venus with a velocity of 400 km/hr from east to west.

Outline of Venus Climate Orbiter Akatsuki mission:

The Venus Climate orbiter mission Akatsuki (PLANET-C) is part of Japan's planet probe project, following the Mars Orbiter NOZOMI (PLANET-B). AKATSUKI aims at understanding the mystery of the Venus climate and atmosphere. The orbiter will be launched in 2010 to arrive into Venus orbit about six months after launch. It will then observe the Venusian atmosphere for about two years.

Mission Goals:

Venus is often called a "sister planet of the Earth." Although the two planets share some similarities, such as the dimension and the distance from the Sun, the environment of Venus is completely different from that of the Earth, as Venus is a red hot planet with sulfur clouds around it and surrounded by carbon dioxide. By studying this unique climate of Venus, we will be able to find some clues to clarify the birth of the Earth and its climate change. In other words, Venus climate exploration is one of the most important studies to understand the Earth's environment.

Akatsuki is a pioneer in the era of Venus exploration. AKATSUKI will be injected into an elliptical orbit at a peri-Venus altitude of 300 km and apo-Venus altitude of 80,000 km. By utilizing the difference of distances from Venus, the AKATSUKI will observe the overall meteorological phenomena and a broad area of the surface of Venus, and take close-up images of the atmosphere and clouds that escape from Venus into space. Also, on the surface of Venus, violent winds called a "super rotation," whose velocity reaches 100 meters per second, will be observed. This super rotation, whose velocity is 60 times faster than Venus's rotation, is one of the biggest mysteries of Venus, since its cause is yet to be explained meteorologically. AKATSUKI aims at clarifying this mystery through infrared light observations of the surface of Venus, penetrating through its atmosphere and clouds. In addition, the mission will also study the electrical discharge of lightning at Venus, and the existence of volcanic activities.

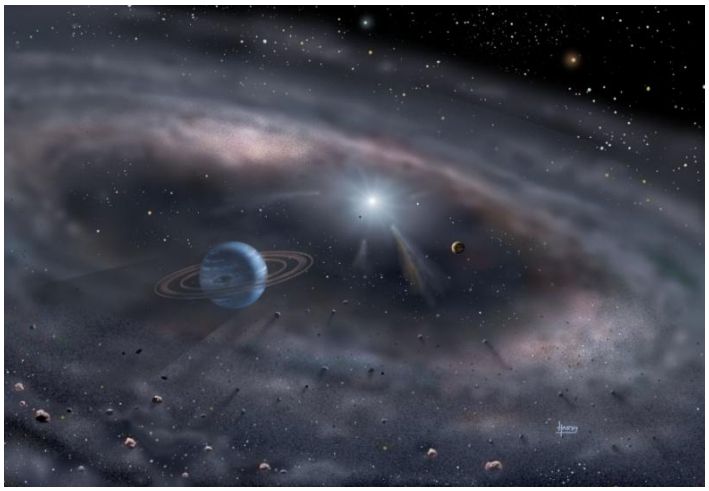
Venus Climate Orbiter AKATSUKI (PLANET-C)
http://www.jaxa.jp/projects/sat/planet_c/index_e.html
AKATSUKI Message Campaign http://www.jaxa.jp/event/akatsuki/index_e.html
Article : http://www.jaxa.jp/press/2009/12/20091217_akatsuki_e.html

KECK TELESCOPES GAZE INTO YOUNG STAR'S 'LIFE ZONE'

The inner regions of young planet-forming disks offer information about how worlds like Earth form, but not a single telescope in the world can see them. Now, for the first time, astronomers using the Keck Observatory in Hawaii have measured the properties of a young solar system at distances closer to the star than Venus is from our sun.

To achieve the feat, the team used the Keck Interferometer to combine infrared light gathered by both of the observatory's twin 10-meter (98-foot) telescopes, which are separated by 85 meters (93 yards). The double-barreled approach gives astronomers the effective resolution of a single 85-meter telescope -- several times larger than any now planned. "Nothing else in the world provides us with the types of measurements the Keck Interferometer does," said Wesley Traub. "In effect, it's a zoom lens for the Keck telescopes." The inner regions of

young planet-forming disks offer information about how worlds like Earth form, but not a single telescope in the world can see them. “When it comes to building rocky planets like our own, the innermost part of the disk is where the action is," said team member William Danchi. Planets forming in a star's inner disk may orbit within its "habitable zone," where conditions could potentially support the development of life.



Planets form around a young star in this artist's concept. Using the Keck Interferometer in Hawaii, astronomers have probed the structure of a dust disk around MWC 419 to within 50 million miles of the star. Credit: David A. Hardy/www.astroart.org

In August 2008, the team - led by Sam Ragland - observed a Young Stellar Object (YSO) known as MWC 419. The blue, B-type star has several times the sun's mass and lies about 2,100 light-years away in the constellation Cassiopeia. With an age less than ten million years, MWC 419 ranks as a stellar kindergartener.

The team also employed a new near-infrared camera designed to image wavelengths in the so-called L band from 3.5 to 4.1 micrometers. "This unique infrared capability adds a new dimension to the Keck Interferometer in probing the density and temperature of planet-forming regions around YSO disks. This wavelength region is relatively unexplored," Ragland explained. "Basically, anything we see through this camera is brand new information." The increased ability to observe fine detail, coupled with the new camera, let the team measure temperatures in the planet-forming disk to within about 50 million miles of the star. "That's about half of Earth's distance from the sun, and well within the orbit of Venus," Danchi said. For comparison, the planets directly detected around the stars HR 8799, Fomalhaut and GJ 758 orbit between 40 and 100 times farther away.

The team reported temperature measurements of dust at various regions throughout MWC 419's inner disk in the Sept. 20 issue of The Astrophysical Journal. Temperature differences help shed light on the inner disk's detailed structure and may indicate that its dust has different chemical compositions and physical properties, factors that may play a role in the types of planets that form. For example, conditions in our solar system favored the formation of rocky worlds from Mars sunward, whereas gas giants and icy moons assembled farther out. In turn, the astronomers note, the size of the young star might affect the composition and physical characteristics of its dust disk. The team is continuing to use the Keck Interferometer in a larger program to observe planet-forming disks around sun-like stars.

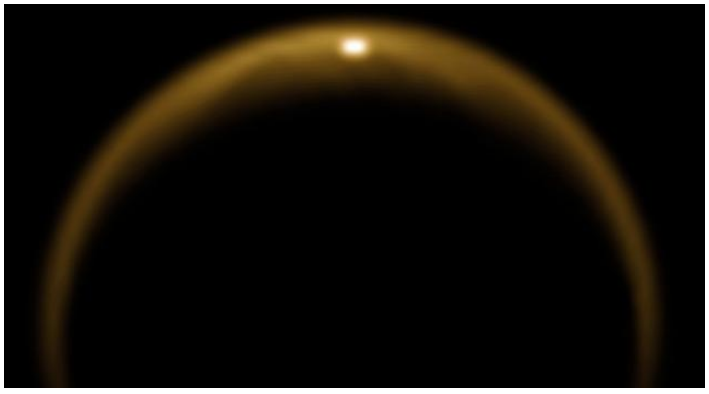
The Keck Interferometer was developed by JPL, and Keck Observatory, which operates two 10-meter optical/infrared telescopes on the summit of Mauna Kea on the island of Hawaii. For more information, please visit: http://www.nasa.gov/topics/universe/features/keck-life-zone.html http://www.jpl.nasa.gov/news/features.cfm?feature=2421

Closest View Ever of Saturn’s Moon Prometheus

The small Saturnian moon Prometheus, 74 miles (119 km) long, appears to be thickly mantled with dust from Saturn's F ring. The Cassini orbiter snapped the frames for this composite image on December 26, 2009, from 36,000 miles (59,000 km) away. NASA / JPL / Space Science Inst. / S. Walker

Sunlight Glint Confirms Liquid in Northern Lake District of Titan

The Cassini Spacecraft has captured the first flash of sunlight reflected off a lake on Saturn's moon Titan, confirming the presence of liquid on the part of the moon dotted with many large, lake-shaped basins. Cassini scientists had been looking for the glint, also known as a specular reflection, since the spacecraft began orbiting Saturn in 2004. But Titan's northern hemisphere, which has more lakes than the southern hemisphere, has been veiled in winter darkness. The sun only began to directly illuminate the northern lakes recently as it approached the equinox of August 2009, the start of spring in the northern hemisphere. Titan's hazy atmosphere also blocked out reflections of sunlight in most wavelengths. This serendipitous image was captured on July 8, 2009, using Cassini's visual and infrared mapping spectrometer.



This image shows the first flash of sunlight reflected off a lake on Saturn's moon Titan. The glint off a mirror-like surface is known as a specular reflection. This kind of glint was detected by the visual and infrared mapping spectrometer (VIMS) on NASA's Cassini spacecraft on July 8, 2009. It confirmed the presence of liquid in the moon's northern hemisphere, where lakes are more numerous and larger than those in the southern hemisphere. Scientists using VIMS had confirmed the presence of liquid in Ontario Lacus, the largest lake in the southern hemisphere, in 2008. Image Credit: NASA/JPL/University of Arizona/DLR

The new infrared image is available online at: http://www.nasa.gov/cassini http://saturn.jpl.nasa.gov and http://wwwvims.lpl.arizona.edu .

"This one image communicates so much about Titan -- thick atmosphere, surface lakes and an other-worldliness," said Bob Pappalardo, Cassini project scientist. "It's an unsettling combination of strangeness yet similarity to Earth. This picture is one of Cassini's iconic images." Titan, Saturn's largest moon, has captivated scientists because of its many similarities to Earth. Scientists have theorized for 20 years that Titan's cold surface hosts seas or lakes of liquid hydrocarbons, making it the only other planetary body besides Earth believed to harbor liquid on its surface. While data from Cassini have not indicated any vast seas, they have revealed large lakes near Titan's north and south poles. In 2008, Cassini scientists using infrared data confirmed the presence of liquid in Ontario Lacus, the largest lake in Titan's southern hemisphere. But they were still looking for the smoking gun to confirm liquid in the northern hemisphere, where lakes are also larger.

Katrin Stephan, an associate member of the Cassini visual and infrared mapping spectrometer team, was processing the initial image and was the first to see the glint on July 10th. "I was instantly excited because the glint reminded me of an image of our own planet taken from orbit around Earth, showing a reflection of sunlight on an ocean," Stephan said. "But we also had to do more work to make sure the glint we were seeing wasn't lightning or an erupting volcano." Team members processed the image further, and scientists were able to compare the new image to radar and near-infrared-light images acquired from 2006 to 2008. They were able to correlate the reflection to the southern shoreline of a lake called Kraken Mare. The sprawling Kraken Mare covers about 400,000 square kilometers (150,000 square miles), an area larger than the Caspian Sea, the largest lake on Earth. It is located around 71 degrees north latitude and 337 degrees west latitude. The finding shows that the shoreline of Kraken Mare has been stable over the last three years and that Titan has an ongoing hydrological cycle that brings liquids to the surface, said Ralf Jaumann, a visual and infrared mapping spectrometer team member. Of course, in this case, the liquid in the hydrological cycle is methane rather than water, as it is on Earth. "These results remind us how unique Titan is in the solar system," Jaumann said. "But they also show us that liquid has a universal power to shape geological surfaces in the same way, no matter what the liquid is."
http://www.jpl.nasa.gov/news/news.cfm?release=2009-199

FIRST SUPER-EARTHS DISCOVERED AROUND SUN-LIKE STARS

Two nearby stars have been found to harbor "super-Earths" - rocky planets larger than the Earth but smaller than ice giants such as Uranus and Neptune. Unlike previously discovered stars with super-Earths, both of the stars are similar to the Sun, suggesting to scientists that low-mass planets may be common around nearby stars.

"Over the last 12 years or so nearly 400 planets have been found, and the vast majority of them have been very large - Jupiter mass or even larger," says researcher Paul Butler. "These latest planets are part of a new trend of finding much smaller planets - planets that are more comparable to Earth."

The international team of researchers, co-led by Butler and Steven Vogt, was able to detect the new planetary systems by combining data from observations spanning several years at the W. M. Keck Observatory in Hawaii and the Anglo-Australian Telescope in New South Wales, Australia. The researchers used the subtle "wobbling" of the stars caused by the planets' gravitational pull to determine the planets' size and orbits. Greg Henry independently monitored the brightness of the stars to rule out stellar "jitter" - roiling of gases on a star's surface that can be confused with a planet-induced wobble.

The bright star 61 Virginis, visible with the naked eye in the constellation Virgo, is only 28 light-years from Earth and closely resembles the Sun in size, age and other properties. Earlier studies had eliminated the possibility of a Jupiter-sized planet orbiting 61 Virginis. In this study, the researchers found evidence of three low-mass planets, the smallest of which is five times the mass of Earth and speeds around the star once every four days.

Butler points out that the signal produced by this planet was one of the smallest ever detected. "One has to be very cautious when you claim a discovery," he says. "What gives us confidence is that we see the signal from two separate telescopes, and the two signals match up perfectly."

The other newly-discovered system orbits the star HD 1461, located 76 light-years from Earth. HD 1461 also closely resembles the Sun and is visible in the constellation Cetus. The researchers found clear evidence for one planet 7.5 times the mass of Earth and possible indications of two others. The 7.5-Earth-mass planet, designated HD 1461b, is intermediate in size between Earth and Uranus. It orbits its star once every six days.

These planets have orbits close to their stars and so they would be too hot to support life or liquid water. But Butler says that they point the way toward finding similar planets in similar orbits around nearby M-dwarfs, stars that are typically less than half the mass of the Sun and typically put out less than two percent the Sun's energy. "These sorts of planets around M dwarfs actually would be in a liquid water zone," he says. "So we are knocking on the door right now of being able to find habitable planets."
http://www.ciw.edu/news/first_super_earths_discovered_around_sun_stars

DARK SIDE OF THE MOON: IAPETUS IS COATED WITH FOREIGN DUST

Iapetus is often called Saturn's most bizarre moon, due to its starkly contrasting hemispheres -- one black as coal, the other white as snow.

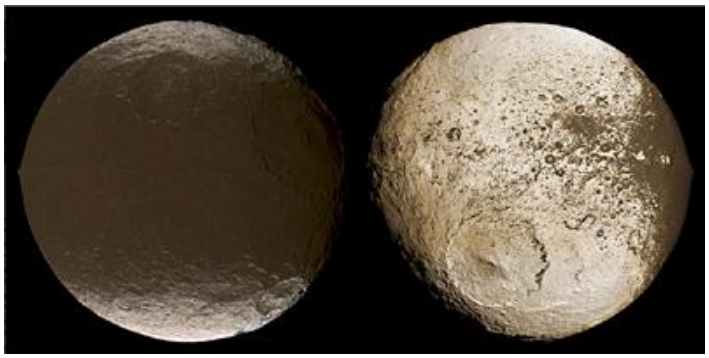
Images taken by the Cassini-Huygens spacecraft, orbiting Saturn since 2004, offer the most compelling evidence to date of why and how the moon got its yin-yang appearance, as well as clues to how other such satellites might have formed in the early universe. Analyzed by a research team that includes Cornell scientists, the images are detailed in the Dec. 10 online edition of the journal Science.

"This is not the most fundamental problem in the world," said research team member Joseph A. Burns. "But it's an enigma that's been puzzling astronomers for centuries."

Since pictures of Iapetus from the Voyager mission 30 years ago confirmed its intriguing color scheme, scientists have puzzled over whether Iapetus' dark-light contrast was the result of external debris hitting some of the moon, or whether the dark dust was the result of interior activity. Now they know the dust came from elsewhere.

Using pictures taken by Cassini, particularly during a September 2007 close fly-by, the scientists assert that Iapetus' darker half, called Cassini Regio, is the result of the planet's leading side getting bombarded by dusty debris from another Saturnian moon, Phoebe, which orbits in the opposite direction beyond Iapetus. It is a longstanding theory, but in a paper published in the journal Nature in October, three Cornell-trained astronomers announced the discovery of an enormous ring of debris -- 10,000 times the area of Saturn's famous main ring system -- around Saturn and near Phoebe, pointing to it as the ring's source. Burns calls this ring the "smoking gun" supporting dust hitting Iapetus and other moons around Saturn. "The ring of collisional debris that has come off Phoebe is out there, and its companion moons are out there, and now we understand the process whereby the stuff is coming in," Burns said.

"When you see the coating pattern on Iapetus, you know you've got the right mechanism for producing it." Small, white craters that dot Iapetus' darker half indicate a veneer of dark dust, only meters deep, covering a white, icy surface that matches the rest of the satellite. The imaging data also revealed that all the materials on the leading side are much redder than the shielded and brighter trailing side -- another indication that the leading side's dust came from elsewhere.



Cassini-Huygens spacecraft images of Iapetus' dark, leading side and its bright, trailing side. The high-resolution images shed new light on the long-standing puzzle of how Iapetus got its unusual coloration. Cassini imaging team.

Other pictures showed that the transition from the dark to light hemisphere is not a solid line, but rather a mottled, patchy array of bright and dark spots. The pattern, the scientists say, supports a previous theory described in a companion paper in Science that the darker parts of the moon tend to heat up when struck by sunlight, causing the ice to evaporate underneath. This causes any dark spots to get even darker, creating the mottled look. http://www.news.cornell.edu/stories/Dec09/CassiniIapetus.html

SATURN'S MYSTERIOUS HEXAGON EMERGES FROM WINTER DARKNESS

After waiting years for the sun to illuminate Saturn's north pole again, cameras aboard Cassini spacecraft have captured the most detailed images yet of the intriguing hexagon shape crowning the planet. The new images of the hexagon, whose shape is the path of a jet stream flowing around the north pole, reveal concentric circles, curlicues, walls and streamers not seen in previous images. The last visible-light images of the entire hexagon were captured by Voyager spacecraft nearly 30 years ago, the last time spring began on Saturn. After the sunlight faded, darkness shrouded the north pole for 15 years. Much to the delight and bafflement of Cassini scientists, the location and shape of the hexagon in the latest images match up with what they saw in the Voyager pictures.

"The longevity of the hexagon makes this something special, given that weather on Earth lasts on the order of weeks," said Kunio Sayanagi, a Cassini imaging team associate. "It's a mystery on par with the strange weather conditions that give rise to the long-lived Great Red Spot of Jupiter." The hexagon was originally discovered in images taken by the Voyager spacecraft in the early 1980s. It encircles Saturn at about 77 degrees north latitude and has been estimated to have a diameter wider than two Earths. The jet stream is believed to whip along the hexagon at around 100 meters per second (220 miles per hour).

Early hexagon images from Voyager and ground-based telescopes suffered from poor viewing perspectives. Cassini, which has been orbiting Saturn since 2004, has a better angle for viewing the north pole. But the long darkness of Saturnian winter hid the hexagon from Cassini's visible-light cameras for years. Infrared instruments, however, were able to obtain images by using heat patterns. Those images showed the hexagon is nearly stationary and extends deep into the atmosphere. They also discovered a hotspot and cyclone in the same region. The visible-light cameras of Cassini's imaging science subsystem, which have higher resolution than the infrared instruments and the Voyager cameras, got their long-awaited glimpse of the hexagon in January, as the planet approached equinox. Imaging team scientists calibrated and stitched together 55 images to create a mosaic and three-frame movie. The mosaics do not show the region directly around the north pole because it had not yet fully emerged from winter night at that time.

Scientists are still trying to figure out what causes the hexagon, where it gets and expels its energy and how it has stayed so organized for so long. They plan to search the new images for clues, taking an especially close look at the newly identified waves that radiate from the corners of the hexagon -- where the jet takes its hardest turns -- and the multi-walled structure that extends to the top of Saturn's cloud layer in each of the hexagon's six sides. Scientists are also particularly intrigued by a large dark spot that appeared in a different position in a previous infrared image from Cassini. In the latest images, the spot appears in the 2 o'clock position.

Because Saturn does not have land masses or oceans on its surface to complicate weather the way Earth does, its conditions should give scientists a more elementary model to study the physics of circulation patterns and atmosphere, said Kevin Baines, an atmospheric scientist, who has studied the hexagon with Cassini's visual and infrared mapping spectrometer. "Now that we can see undulations and circular features instead of blobs in the hexagon, we can start trying to solve some of the unanswered questions about one of the most bizarre things we've ever seen in the solar system," Baines said. "Solving these unanswered questions about the hexagon will help us answer basic questions about whether that we're still asking about our own planet." http://www.jpl.nasa.gov/news/news.cfm?release=2009-187 Images and the three-frame animation are available at http://www.nasa.gov/cassini, http://saturn.jpl.nasa.gov and http://ciclops.org .

SCIENTISTS EXPLAIN PUZZLING NORTH/SOUTH LAKE ASYMMETRY ON TITAN

Researchers suggest that the eccentricity of Saturn's orbit around the sun may be responsible for the unusually uneven distribution of lakes over the northern and southern polar regions of the planet's largest moon, Titan. Saturn's oblong orbit around the sun exposes different parts of Titan to different amounts of sunlight, which affect cycles of precipitation and evaporation in those areas. Similar variations in Earth's orbit also drive long-term ice-age cycles on our planet.

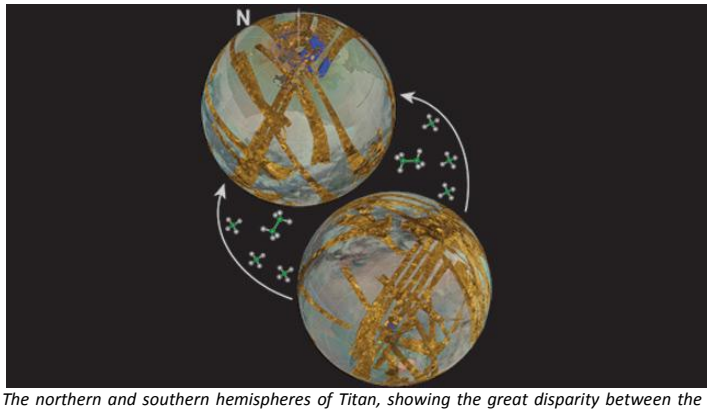
As revealed by Synthetic Aperture Radar imaging data from Cassini spacecraft, liquid methane and ethane lakes in Titan's northern high latitudes cover 20 times more area than lakes in the southern high latitudes. The Cassini data also show there are significantly more partially filled and now-empty lakes in the north. (In the radar data, smooth features -- like the surfaces of lakes -- appear as dark areas, while rougher features -- such as the bottom of an empty lake-appear bright.) The asymmetry is not likely to be a statistical fluke because of the large amount of data collected by Cassini in its five years surveying Saturn and its moons.

Scientists initially considered the idea that "there is something inherently different about the northern polar region versus the south in terms of topography, such that liquid rains, drains or infiltrates the ground more in one hemisphere," said Oded Aharonson, lead author of the paper. However, Aharonson notes that there are no substantial known differences between the north and south regions to support this possibility. Alternatively, the mechanism responsible for this regional dichotomy may be seasonal. One year on Titan lasts 29.5 Earth years.

Every 15 Earth years, the seasons of Titan reverse, so that it becomes summer in one hemisphere and winter in the other. According to this seasonal variation hypothesis, methane rainfall and evaporation vary in different seasons -- recently filling lakes in the north while drying lakes in the south. The problem with this idea, Aharonson said, is that it accounts for decreases of about one meter per year in the depths of lakes in the summer hemisphere. But Titan's lakes are a few hundred meters deep on average, and wouldn't drain (or fill) in just 15 years. In addition, seasonal variation can't account for the disparity between the hemispheres in the number of empty lakes. The north polar region has roughly three times as many dried-up lake basins as the south and seven times as many partially filled ones. "How do you move the hole in the ground?" Aharonson asked. "The seasonal mechanism may be responsible for part of the global transport of liquid methane, but it's not the whole story." A more plausible explanation, say Aharonson and his colleagues, is related to the eccentricity of the orbit of Saturn -- and hence of Titan, its satellite -- around the sun.

Like Earth and other planets, Saturn's orbit is not perfectly circular, but is instead somewhat elliptical and oblique. Because of this, during its southern summer, Titan is about 12 percent closer to the sun than during the northern summer. As a result, northern summers are long and subdued; southern summers are short and intense. "We propose that, in this orbital configuration, the difference between evaporation and precipitation is not equal in opposite seasons, which means there is a net transport of methane from south to north," said Aharonson. This imbalance would lead to an accumulation of methane -- and hence the formation of many more lakes -- in the northern hemisphere.

This situation is only true right now, however. Over very long time scales of tens of thousands of years, Saturn's orbital parameters vary, at times causing Titan to be closer to the sun during its northern summer and farther away in southern summers, and producing a reverse in the net transport of methane. This should lead to a buildup of hydrocarbon -- and an abundance of lakes -- in the southern hemisphere.



The northern and southern hemispheres of Titan, showing the great disparity between the abundance of lakes in the north and their paucity in the south. The hypothesis presented favors long-term flux of volatile hydrocarbons, predominantly methane, from hemisphere to hemisphere. Recently, the direction of transport has been from south to north, but the effect would have reversed tens of thousands of years ago. Image credit: NASA/JPL/Caltech/UA/SAR

"Like Earth, Titan has tens-of-thousands-of-year variations in climate driven by orbital motions," Aharonson said. On Earth, these variations, known as Milankovitch cycles, are linked to changes in solar radiation, which affect global redistribution of water in the form of glaciers, and are believed to be responsible for ice-age cycles. "On Titan, there are long-term climate cycles in the global movement of methane that make lakes and carve lake basins. In both cases we find a record of the process embedded in the geology," he added. "We may have found an example of long-term climate change, analogous to Milankovitch climate cycles on Earth, on another object in the solar system," he said. For more information about the Cassini-Huygens mission, visit: http://www.nasa.gov/cassini or http://saturn.jpl.nasa.gov/index.cfm . http://www.jpl.nasa.gov/news/news.cfm?release=2009-180

MONSTER TSUNAMI WAVES ON THE SUN ARE REAL

November 24, 2009: Sometimes you really can believe your eyes. That's what the STEREO (Solar Terrestrial Relations Observatory) spacecraft are telling researchers about a controversial phenomenon on the sun known as the "solar tsunami." Years ago, when solar physicists first witnessed a towering wave of hot plasma racing along the sun's surface, they doubted their senses. The scale of the thing was staggering. It rose up higher than Earth itself and rippled out from a central point in a circular pattern millions of kilometers in circumference. Skeptical observers suggested it might be a shadow of some kind - a trick of the eye - but surely not a real wave. "Now we know," says Joe Gurman. "Solar tsunamis are real."

The twin STEREO spacecraft confirmed their reality in February 2009 when sunspot 11012 unexpectedly erupted. The blast hurled a billion-ton cloud of gas (a "CME") into space and sent a tsunami racing along the sun's surface. STEREO recorded the wave from two positions separated by 90 degrees , giving researchers an unprecedented view of the event: "It was definitely a wave," says Spiros Patsourakos, lead author of a paper reporting the finding. "Not a wave of water," he adds, "but a giant wave of hot plasma and magnetism." The technical name is "fast-mode magnetohydrodynamical wave" or "MHD wave" for short. The one STEREO saw reared up about 100,000 km high, and raced outward at 250 km/s (560,000 mph) packing as much energy as 2400 megatons of TNT (10^{29} ergs).

Solar tsunamis were discovered back in 1997 by the Solar and Heliospheric Observatory (SOHO). In May of that year, a CME came blasting up from an active region on the sun's surface, and SOHO recorded a tsunami rippling away from the blast site. "We wondered," recalls Gurman, "is that a wave - or just a shadow of the CME overhead?" SOHO's single point of view was not enough to answer the question - neither for that first wave nor for many similar events recorded by SOHO in years that followed.

The question remained open until after the launch of STEREO in 2006. At the time of the February 2009 eruption, STEREO-B was directly over the blast site while STEREO-A was stationed at right angles - "perfect geometry for cracking the mystery," says co-author Angelos Vourlidas.

The physical reality of the waves has been further confirmed by movies of the waves crashing into things. "We've seen the waves reflected by coronal holes (magnetic holes in the sun's atmosphere)," says Vourlidas. "And there is a wonderful movie of a solar prominence oscillating after it gets hit by a wave. We call it the 'dancing prominence.'"

Solar tsunamis pose no direct threat to Earth. Nevertheless, they are important to study. "We can use them to diagnose conditions on the sun," notes Gurman. "By watching how the waves propagate and bounce off things, we can gather information about the sun's lower atmosphere available in no other way." "Tsunami waves can also improve our forecasting of space weather," adds Vourlidas, "Like a bull-eye, they 'mark the spot' where an eruption takes place. Pinpointing the blast site can help us anticipate when a CME or radiation storm will reach Earth." And they're pretty entertaining, too. "The movies," he says, "are out of this world." http://science.nasa.gov/headlines/y2009/24nov_solartsunami.htm

SPITZER TELESCOPE OBSERVES BABY BROWN DWARF

The Spitzer Space Telescope has contributed to the discovery of the youngest brown dwarf ever observed -- a finding that, if confirmed, may solve an astronomical mystery about how these cosmic misfits are formed. Brown dwarfs are misfits because they fall somewhere between planets and stars in terms of their temperature and mass. They are cooler and more lightweight than stars and more massive (and normally warmer) than planets. This has generated a debate among astronomers: Do brown dwarfs form like planets or like stars? Brown dwarfs are born of the same dense, dusty clouds that spawn stars and planets. But while they may share the same galactic nursery, brown dwarfs are often called "failed" stars because they lack the mass of their hotter, brighter stellar siblings. Without that mass, the gas at their core does not get hot enough to trigger the nuclear fusion that burns hydrogen -- the main component of these molecular clouds -- into helium. Unable to ignite as stars, brown dwarfs end up as cooler, less luminous objects that are more difficult to detect -- a challenge that was overcome in this case by Spitzer's heat-sensitive infrared vision.

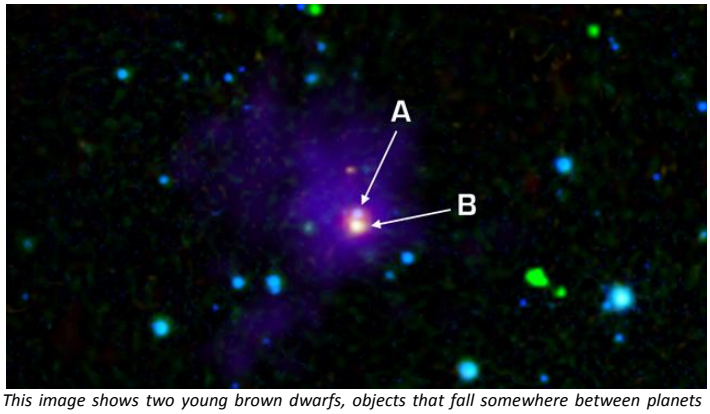
To complicate matters, young brown dwarfs evolve rapidly, making it difficult to catch them when they are first born. The first brown dwarf was discovered in 1995 and, while hundreds have been found since, astronomers had not been able to unambiguously find them in their earliest stages of formation until now. In this study, an international team of astronomers found a so-called "proto brown dwarf" while it was still hidden in its natal star-forming region. Guided by Spitzer data collected in 2005, they focused their search in the dark cloud Barnard 213, a region of the Taurus-Auriga complex well known to astronomers as a hunting ground for young objects.

"We decided to go several steps back in the process when (brown dwarfs) are really hidden," said David Barrado, lead author of the paper on the discovery. "During this step they would have an (opaque) envelope, a cocoon, and they would be easier to identify due to their strong infrared excesses. We have used this property to identify them. This is where Spitzer plays an important role because Spitzer can have a look inside these clouds. Without it this wouldn't have been possible."

Spitzer's longer-wavelength infrared camera penetrated the dusty natal cloud to observe a baby brown dwarf named SSTB213 J041757. The data, confirmed with near-infrared imaging from Calar Alto Observatory in Spain, revealed not one but two of what would potentially prove to be the faintest and coolest brown dwarfs ever observed.

Barrado and his team embarked on an international quest for more information about the two objects. Their overarching scientific objective was to observe and characterize the presence of this dusty envelope -- proof of the celestial womb of sorts that would indicate that these brown dwarfs were, in fact, in their earliest evolutionary stages. The twins were observed from around the globe, and their properties were measured and analyzed using a host of powerful astronomical tools. One of the astronomers' stops was the Caltech Submillimeter Observatory in Hawaii, which captured the presence of the envelope around the young objects. That information, coupled with what they had from Spitzer, enabled the astronomers to build a spectral energy distribution -- a diagram that shows the amount of energy that is emitted by the objects in each wavelength.

From Hawaii, the astronomers made additional stops at observatories in Spain (Calar Alto Observatory), Chile (Very Large Telescopes) and New Mexico (Very Large Array). They also pulled decade-old data from the Canadian Astronomy Data Centre archives that allowed them to comparatively measure how the two objects were moving in the sky. After more than a year of observations, they drew their conclusions.



This image shows two young brown dwarfs, objects that fall somewhere between planets and stars in terms of their temperature and mass. Brown dwarfs are cooler and less massive than stars, never igniting the nuclear fires that power their larger cousins, yet they are more massive (and normally warmer) than planets. When brown dwarfs are born, they heat the nearby gas and dust, which enables powerful infrared telescopes like NASA's Spitzer Space Telescope to detect their presence. Here we see these very young objects, labeled as A and B, which appear as closely-spaced purple-blue and orange-white dots at the very center of image. The surrounding envelope of cool dust surrounding this nursery is in purple. These "twins," which were found in the region of the Taurus-Auriga star-formation complex, are the youngest of their kind ever detected. Based on these findings, the researchers think they have found that brown dwarfs form like stars. This image combined data from three telescopes on the ground and in space. Near-infrared observations at the Calar Alto Observatory in Spain cover wavelengths of 1.3 and 2.2 microns (rendered as blue). Spitzer's infrared array camera shows 4.5-micron (green) and 8.0-micron (yellow) observations, and its multiband imaging photometer added 24-micron (red) component. The Caltech Submillimeter Observatory in Hawaii made far-infrared observations at 350 microns (purple). These observations were made before Spitzer ran out its coolant in May 2009. Image credit: NASA/JPL-Caltech/Calar Alto Obsv./Caltech Sub. Obsv.

"We were able to estimate that these two objects are the faintest and coolest discovered so far," Barrado said. Barrado said the findings potentially solve the mystery about whether brown dwarfs form more like stars or planets. The answer? They form like low-mass stars. This theory is bolstered because the change in brightness of the objects at various wavelengths matches that of other very young, low-mass stars.

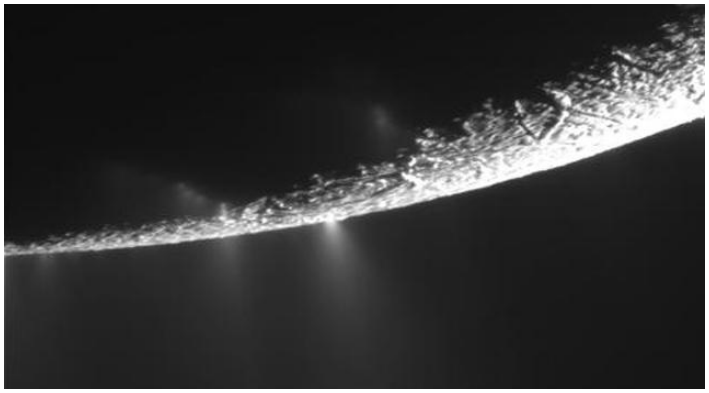
While further study will confirm whether these two celestial objects are in fact proto brown dwarfs, they are the best candidates so far, Barrado said. He said the journey to their discovery, while difficult, was fun. "It is a story that has been unfolding piece by piece. Sometimes nature takes its time to give up its secrets." These observations were made before Spitzer ran out of its liquid coolant in May 2009, beginning its "warm" mission. http://www.jpl.nasa.gov/news/news.cfm?release=2009-174

CASSINI SENDS BACK IMAGES OF ENCELADUS AS WINTER NEARS

The Cassini spacecraft has sailed seamlessly through the Nov. 21 flyby of Saturn's moon Enceladus and started transmitting uncalibrated temperature data and images of the rippling terrain. They will help scientists create the most-detailed-yet mosaic image of the southern part of the moon's Saturn-facing hemisphere and a contiguous thermal map of one of the intriguing "tiger stripe" features, with the highest resolution to date.

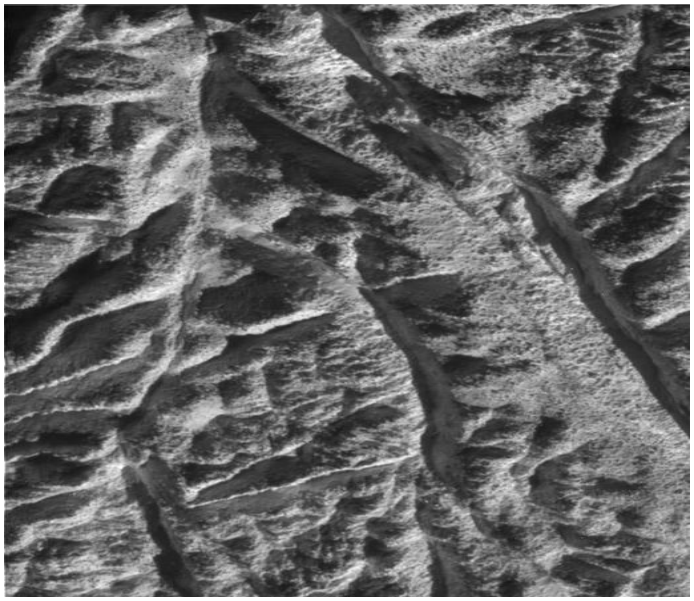
"These first raw images are spectacular, and paint an even more fascinating picture of Enceladus," said Bob Pappalardo, Cassini project scientist. "The Cassini teams will be delving into the data to better understand the workings of this bizarre, active moon." Scientists are particularly interested in the tiger stripes, which are fissures in the south polar region, because they spew jets of water vapor and other particles hundreds of kilometers, or miles, from the surface. This flyby was scientists' last peek at the tiger stripes before the south pole fades

into the darkness of winter for several years. The thermal imaging work focused on the tiger stripe known as Baghdad Sulcus.



This unprocessed image was captured by NASA's Cassini spacecraft during its Nov. 21, 2009 flyby of Saturn's moon Enceladus. It shows the moon's south polar region, where jets of water vapor and other particles spew from fissures on the surface. Image credit: NASA/JPL/Space Science Institute

The Nov. 21 encounter, which is sometimes called "E8" because it is the eighth targeted flyby of Enceladus, brought Cassini to within about 1,600 kilometers (1,000 miles) of the moon's surface, at around 82 degrees south latitude. Cassini is now cruising toward Rhea, another one of Saturn's moons, for more imaging and mapping work.



Unprocessed image from Cassini's Enceladus flyby - This unprocessed image was captured by NASA's Cassini spacecraft during its Nov. 21, 2009 flyby of Saturn's moon Enceladus. It shows the ridges and fractures on the surface of the icy moon. Image credit: NASA/JPL/Space Science Institute.

Full image and caption http://www.nasa.gov/mission_pages/cassini/multimedia/cassini-b-20091121.html http://www.jpl.nasa.gov/images/cassini/20091121/cassini20091121-b-full.jpg
http://www.jpl.nasa.gov/news/features.cfm?feature=2372
Full gallery of raw images, http://saturn.jpl.nasa.gov/photos/raw/
Flyby info http://saturn.jpl.nasa.gov/mission/flybys/enceladus20091121/

CASSINI CAPTURES GHOSTLY DANCE OF SATURN'S NORTHERN LIGHTS

In the first video showing the auroras above the northern latitudes of Saturn, Cassini has spotted the tallest known "northern lights" in the solar system, flickering in shape and brightness high above the ringed planet. The new video reveals changes in Saturn's aurora every few minutes, in high resolution, with three dimensions. The images show a previously unseen vertical profile to the auroras, which ripple in the video like tall curtains. These curtains reach more than 1,200 kilometers (750 miles) above the edge of the planet's northern hemisphere. The new video and still images are online at: http://www.nasa.gov/multimedia/nasatv/on_demand_video.html?param=http://mfile.akamai.com/20356/mov/etouchsyst2.download.akamai.com/18355/qt.nasa-global/ccvideos/jpl/aurora20091124a-480cc.mov&_id=213668&_title=Saturn%27s%20Aurora%20in%20a%20New%20Light&_tnimage=406625main_cassini20091124-c-th.jpg http://www.nasa.gov/cassini , http://saturn.jpl.nasa.gov and http://ciclops.org

Auroras occur on Earth, Jupiter, Saturn and a few other planets, and the new images will help scientists better understand how they are generated. "The auroras have put on a dazzling show, shape-shifting rapidly and exposing curtains that we suspected were there, but hadn't seen on Saturn before," said Andrew Ingersoll, who is a member of the Cassini imaging team that processed the new video. "Seeing these things on another planet helps us understand them a little better when we see them on Earth." Auroras appear mostly in the high latitudes near a planet's magnetic poles. When charged particles from the magnetosphere -- the magnetic bubble surrounding a planet -- plunge into the planet's upper atmosphere, they cause the atmosphere to glow. The curtain shapes show the paths that these charged particles take as they flow along the lines of the magnetic field between the magnetosphere and the uppermost part of the atmosphere.

The height of the curtains on Saturn exposes a key difference between Saturn's atmosphere and our own, Ingersoll said. While Earth's atmosphere has a lot of oxygen and nitrogen, Saturn's atmosphere is composed primarily of hydrogen. Because hydrogen is very light, the atmosphere and auroras reach far out from Saturn. Earth's auroras tend to flare only about 100 to 500 kilometers (60 to 300 miles) above the surface. The speed of the auroral changes in the video is comparable to some of those on Earth, but scientists are still working to understand the processes that produce these rapid changes. The height will also help them learn how much energy is required to light up auroras. "I was wowed when I saw these images and the curtain," said Tamas Gombosi, who chairs Cassini's magnetosphere and plasma science working group. "Put this together with the other data Cassini has collected on the auroras so far, and you really get a new science."

Ultraviolet and infrared instruments on Cassini have captured images of and data from Saturn's auroras before, but in these latest images, Cassini's narrow-angle camera was able to capture the northern lights in the visible part of the light spectrum, in higher resolution. The movie was assembled from nearly 500 still pictures spanning 81 hours between Oct. 5 and Oct. 8, 2009. Each picture had an exposure time of two or three minutes. The camera shot pictures from the night side of Saturn. The images were originally obtained in black and white, and the imaging team highlighted the auroras in false-color orange. The oxygen and nitrogen in Earth's upper atmosphere contribute to the colorful flashes of green, red and even purple in our auroras. But scientists are still working to determine the true color of the auroras at Saturn, whose atmosphere lacks those chemicals. http://www.jpl.nasa.gov/news/news.cfm?release=2009-176

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.

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In December StarGazer:

The next EAS Meeting is 6:00 pm, Saturday January 16th at the Aurora Astro products store near Silver Lake in SE Everett