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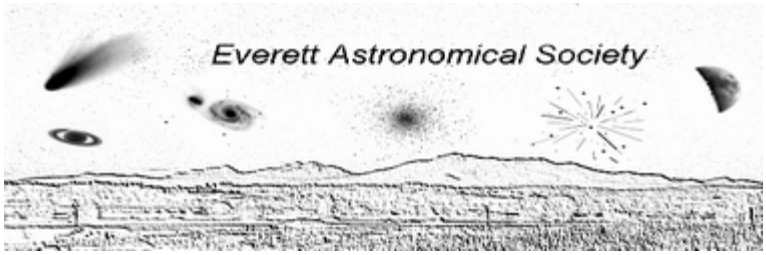

The Stargazer

April 2007

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Web assistance: Cody Gibson	(425) 348-1608	sircody01 at comcast.net	*See EAS website at:*
		(change 'at' to @ to send email)	http://members.tripod.com/everett_astronomy

EAS BUSINESS…

NEXT EAS MEETING – SATURDAY APRIL 14TH AT 3:00 PM AT THE EVERETT PUBLIC LIBRARY, IN THE AUDITORIUM (DOWNSTAIRS)

★★★ APRIL MEETING PROGRAM: ★★★

A spectacular presentation of the Cassini mission to Saturn, called 'Ring World 2', narrated by John Billingsley, in a high-quality production recently released from NASA JPL, with limited distribution to selected astronomy organizations, traces the course of the mission and scientific and imaging results so far.

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

2702 Hoyt Avenue
Everett, WA 98201

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

★ STAR PARTY INFO ★

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

Saturday April 14 - (evening after EAS meeting), weather permitting.

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

Listed below are proposed dates for **planned EAS star parties** at my [Ron Tam's] place, depending upon the weather, of course.

Apr 14 - Saturday, (evening after EAS meeting)
May 19 - Saturday
Jun 16 – Saturday (evening after EAS meeting)
Jul 07 - Saturday
Aug 11 - Saturday
Sep 08 - Saturday
Sep 19 - Saturday
Oct 13 - Saturday
Nov 10 - Saturday

Other dates may be available, but these coincide with times around the new moon, and any conflicts we may have.

Fire In The Sky 2007 rocket launch in Mansfield, WA during the Memorial Day weekend is in a couple of months. The Tacoma Astronomical Society will be there with their telescopes having their star party. The EAS group is welcome to come out and join the crowd. You can see a pic of the flyer for the launch at:
http://www.rocketsnw.com/uploads/FITS2007Flyer3JPEG800X600.jpg

PacSci Astronomy Weekend in North Cascades - July 13-15

This July, Pacific Science Center is excited to offer a weekend of astronomy and natural discovery for its members. Educators from Pacific Science Center and the North Cascades Institute are teaming up to offer a variety of hands-on, family-friendly educational programs. During the day, there will be astronomy classes, guided nature hikes and canoe trips on nearby Diablo Lake. And then at night, discover the night sky like you've never seen it before. We hope you'll join us for a great weekend. July 13-15, North Cascades Environmental Learning Center North Cascades National Park. More information including pricing, detailed program, and reservation forms available shortly, so please check back at Pacific Science Center's website. **http://www.pacsci.org/travel/astronomy_weekend.html**

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

$$ - Financial Health - $$

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

Club Scopes

Scope	Loan Status
10-inch Ward Dobsonian	On loan
10-inch Sonotube Dobsonian	Available
8-inch Dobsonian	Available

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

EAS Member News

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

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

I am proud to be able to offer this discount to Everett club members, and thanks for the support you have shown me on opening my new store. Also I have made great friends and learned a lot being a club member since 1991.

- Clear Skies, Jim Bielaga"

Aurora Astro Products
11419 19th Avenue SE #A102
Everett, WA 98208
425-337-4384
www.auroraastro.com
Open Monday - Friday 9:00 am to 6:00 pm
Saturday 10:00 am to 5:00 pm
Over 37 product dealerships, and growing

Astronomy Day 2007 – April 20 and 21st

Friday Apr 20 – Dusk - Astronomy Day Observing Star party at Harborview Park http://www.everettwa.org/default.aspx?ID=539
Bring your scope

Saturday Apr 21 – 10:00- 5:00 – Displays, Presentations, and Events at Everett Library Auditorium – EAS member volunteers urgently needed for this event.

Saturday Apr 21 - Dusk - Astronomy Day Observing Star party at Harborview Park http://www.everettwa.org/default.aspx?ID=539

http://www.astroleague.org/al/astroday/factsheet.html

EAS members – please mark your calendars for this event !

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

The Northwest Region of the Astronomical League (NWRAL) is putting together a new website and needs the following information from each club of the NWRAL. The EAS is looking for any information from members about the early history. Please contact Mark Folkerts if you have any info that could be of help. NRWAL would like a brief history of the club

- Club established date
- Who started the club
- When club joined the Astronomical League.

Astro Calendar for 2007

April 2007

Apr 08 - Easter Sunday
Apr 16-22 - Astronomy Week - Bringing Astronomy to the People
Apr 14 - EAS April Meeting 3:00 PM – Everett Public Library
Apr 14 - Saturday, EAS Star party at Ron Tam's - after EAS meeting
Apr 20 - Astronomy Day – Friday Star party at Harborview Park
Apr 21 - Astronomy Day – Saturday Star party at Harborview Park
Apr 21 - Astronomy Day Saturday events at Everett Library
http://www.astroleague.org/al/astroday/factsheet.html
Apr 19-22 - OAS Camp Delaney Spring Star Party -
http://www.olympicastronomicalsociety.com/Documents/CAMP%20DELANY%20V2.pdf
Apr 22 - Lyrids Meteor Shower Peak

May 2007

May 05 - Eta Aquarids Meteor Shower Peak
May 12 - EAS May Meeting 3:00 PM – Everett Public Library
May 13-20 - Texas Star Party - http://www.texasstarparty.org/
May 17 - Comet 2P Encke Closest Approach to Earth (0.507 AU)
May 19 - Saturday, EAS Star party at Ron Tam's
May 25-28 - Riverside Telescope Makers Conf. - http://www.rtmc-inc.org/
May 26-28 - Fire In The Sky (WAC launch & star party)
http://www.washingtonaerospace.org/launches.php
May 28 – Memorial Day Holiday

June 2007

Jun 01 - Asteroid 4 Vesta Closest Approach To Earth (1.14 AU)
Jun 06 - Jupiter at opposition
Jun 9-16 Grand Canyon Star Party -
http://www.tucsonastronomy.org/gcsp.html
Jun 14-17 Rocky Mountain Star Stare - http://www.rmss.org/
Jun 16 - EAS March Meeting 3:00 PM – Everett Public Library
Jun 16 - Saturday, EAS Star party at Ron Tam's
Jun 18 - Dwarf Planet 134340 Pluto Closest Approach To Earth (30.2AU)
Jun 20 - Summer Solstice, 20:24 UT
Jun 22-24 - Klickitat County Star Party - http://www.klickitatstarparty.net/
June 30 - Blue Moon (2nd Full Moon of month)

July 2007

Jul 04 - 4th of July Holiday
Jul 07 - Earth At Aphelion (1.017 AU from Sun)
Jul 07 - Saturday, EAS Star party at Ron Tam's
Jul 9-16 - Shingletown Star Party - http://www.shingletownstarparty.net/
Jul 11-14 Golden State Star Party at Mt Lassen NP
http://www.goldenstatestarparty.org/

Jul 13-15 - PacSci Astronomy Weekend in North Cascades
http://www.pacsci.org/travel/astronomy_weekend.html
Jul 12-14 - Table Mountain Star Party - http://www.tmspa.com/
Jul 13-15 - Klickitat County Star Party - http://www.klickitatstarparty.net/
Jul 14 - OAS Hurricane Ridge Star Party -
http://www.olympicastronomicalsociety.com/hurricane_ridge_star_parties.htm
Jul 29 - South Delta-Aquarids Meteor Shower Peak

August 2007

Aug 01 - Alpha Capricornids Meteor Shower Peak
Aug 3-4 - ALCON 2007 Portland Oregon - http://www.alconexpo.com/
Aug 06 - Southern Iota Aquarids Meteor Shower Peak
Aug 8-12 - Mt Bachelor Star Party - http://www.mbsp.org/
Aug 11 - Saturday, EAS Star party at Ron Tam's
Aug 11 - Silver Falls (OR) Star Party -
http://www.oregonstateparks.org/park_211.php
August 11 - ICAS Artist Point Lookout Star Party -
http://groups.msn.com/WashingtonICAS/memberonlyevents.msnw
Aug 11-19 Mt. Kobau Star Party - http://www.mksp.ca/
Aug 12 - Perseids Meteor Shower Peak
Aug 11 - OAS Hurricane Ridge Star Party -
http://www.olympicastronomicalsociety.com/hurricane_ridge_star_parties.htm
Aug 16-19 - Oregon Star Party - http://www.oregonstarparty.org/
Aug 24-26 - RASCal's Star Party - http://victoria.rasc.ca/events/StarParty/
Aug 25 - Northern Iota Aquarids Meteor Shower Peak
Aug 28 - Total Lunar Eclipse - entire eclipse visible

September 2007

Sep 03 - Labor Day Holiday
Sep 6-9 - OAS Camp Delaney Fall Star Party -
http://www.olympicastronomicalsociety.com/Documents/CAMP%20DELANY%20V2.pdf
Sep 08 - Saturday, EAS Star party at Ron Tam's
Sep 6-9 Alberta Star Party - http://calgary.rasc.ca/asp2007.htm
Sep 15 - ASTRONOMY DAY (For Fall too this year!) Star Party
Sep 14-16 - Klickitat County Star Party - http://www.klickitatstarparty.net/
Idaho Star Party, September 9-11, 2005 Boise Astronomical Society
http://www.boiseastro.org/
Sep 19 - Saturday, EAS Star party at Ron Tam's
Sep 20-23 - Orion Nebula Star Party -
http://www.seattleastro.org/orionnebsp.html
Sep 23 - Autumnal Equinox (09:51 UT)
Merritt Star Quest - http://www.merrittastronomical.com/

October 2007

Oct 09 - Draconids Meteor Shower Peak
Oct 13 - Saturday, EAS Star party at Ron Tam's
Oct 14 - Dwarf Planet 136199 Eris Closest Approach To Earth (95.8AU)
Oct 12-14 - Klickitat County Star Party - http://www.klickitatstarparty.net/
Oct 21 - Orionids Meteor Shower Peak
Oct 31 - Halloween

November 2007

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

December 2007

Dec 07 - 35th Anniv (1972), Apollo 17 Launch (Last Mission to Moon)
Dec 13 - Geminids Meteor Shower Peak
Dec 22 - Winter Solstice, 22:06 UT
Dec 22 - Ursids Meteor Shower Peak
Dec 24 - Mars at opposition
Dec 25 - Christmas Holiday

UW Astronomy Speakers Colloquium Schedule

The Astronomy Department weekly colloquium meets Thursdays at 4:00 pm in PAB A102 - the classroom part of the Physics/Astronomy Building complex, (or at 11:30 in C520). www.astro.washington.edu/dept/colloquium.html
Apr 14 - Hugh Hudson, '*Solar Flares in the New Millennium*'
Apr 21 - Naomi McClure-Griffiths, '*HI Supershells and the Galactic Ecosystem*'
Apr 22 - 11:30 C520 Michael Blanton, New York U (title TBA)
Apr 26 - 2:30 A118? Carolyn Porco, Space Science Institute, '*Highlights from Cassini's Imaging Adventures at Saturn*'
Apr 28 - Evan Skillman, U. Minnesota, TBA
May 5 - Keith Holsapple, U.W. Aero & Astro, '*Asteroid Spin Data: No Evidence of Rubble-Pile Structures*'
May 12 - Kristen Larson, WWU, '*Dust Maps: Characterizing Extinction and Reddening of Gas at High Galactic Latitude*'
May 19 - Josh Grindlay, '*Chandra-HST Studies of Compact Objects and Binaries in Globular Clusters*'
May 26 - Paul Boynton, U.W. Astronomy '*Discovery of the CMBR: Looking Back 40 Years*'
Jun 02 - Jim Bell, Cornell , '*Sprit and Opportunity on Mars*'
Jun 09 - Anjum Mukadam, U.W. Astronomy, tba

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

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

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

EAS MEMBERSHIP BENEFITS & INFORMATION

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

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

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

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

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

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

Joining or Renewing with the EAS -

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

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

OBSERVER'S INFORMATION…

LUNAR FACTS

Apr 10	Last Quarter Moon
Apr 17	New Moon
Apr 24	First Quarter Moon
May 02	Full Moon
May 10	Last Quarter Moon
May 16	New Moon
May 23	First Quarter Moon
Jun 01	Full Moon
Jun 08	Last Quarter Moon
Jun 15	New Moon
Jun 22	First Quarter Moon
Jul 30	Full Moon

Digital Lunar Orbiter Photographic Atlas of the Moon

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

UP IN THE SKY -- THE PLANETS

Object	Rises	Transits	Sets	Con	Mag
Sun	**5:26 am**	**12:10**	**18:54**	**Psc**	**-27.5**
Mercury	**5:03 am**	Daylight	Daylight	**Psc**	**+0.2**
Venus **	Daylight	Daylight	**22:29**	**Tau**	**-4.0**
Mars	**4:02 am**	Daylight	Daylight	**Sag**	**+1.1**
Jupiter	**23:43**	**04:03 am**	Daylight	**Oph**	**-2.3**
Saturn **	Daylight	**20:09**	**3:32 am**	**Leo**	**+0.3**
Uranus	**4:23 am**	Daylight	Daylight	Aqr	+5.9
Neptune	**3:26 am**	Daylight	Daylight	**Cap**	**+7.9**
Pluto	**23:53**	**4:43 am**	Daylight	**Sag**	**+14.0**

(times local time for Everett PDT)

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

Transit times for Jupiter's Great Red Spot in 2007
http://skytonight.com/observing/objects/planets/3304091.html

NOAA SUN CALCULATOR

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

INTERNATIONAL SPACE STATION – VISIBLE SEATTLE PASSES

ISS Visibility –
http://spaceflight.nasa.gov/realdata/sightings/SSapplications/Post/SightingData/Seattle.html or also see link http://www.heavens-above.com/PassSummary.asp?lat=47.979&lng=-122.201&alt=0&loc=Everett&TZ=PST&satid=25544

CONSTELLATION OF THE MONTH, PLANETARY FOCUS, YOUNG ASTRONOMER'S CORNER, ASTRONOMY AND TELESCOPE "LINGO", ASTRONOMY "FUN FACTS", AND "MIRROR IMAGES"

These columns will return next month, and will some will be covered in Astronomy Day handout materials.

ASTRONOMICAL NOTES -- ON & OFF THE WEB…

SPITZER FINDS PLANETS THRIVE AROUND STELLAR TWINS

Our universe could be packed with worlds with two or more suns, astronomers conclude from new research with Spitzer Space Telescope. The double sunset that Luke Skywalker gazed upon in the film "Star Wars" might not be a fantasy. Astronomers using Spitzer Space Telescope have observed that planetary systems, dusty disks of asteroids, comets and possibly planets are at least as abundant in twin-star systems as they are in those, like our own, with only one star. Since more than half of all stars are twins, or binaries, the finding suggests the universe is packed with planets that have two suns. Sunsets on some of those worlds would resemble the ones on Luke Skywalker's planet, Tatooine, where two fiery balls dip below the horizon one by one. "*There appears to be no bias against having planetary system formation in binary systems*," said David Trilling, lead author of a new paper about the research. "There could be countless planets out there with two or more suns." Previously, astronomers knew that planets could form in exceptionally wide binary systems, in which stars are 1,000 times farther apart than the distance between Earth and the sun, or 1,000 astronomical units. Of the approximately 200 planets discovered so far outside our solar system, about 50 orbit one member of a wide stellar duo.

The new Spitzer study focuses on binary stars that are a bit more snug, with separation distances between zero and 500 astronomical units. Until now, not much was known about whether the close proximity of stars like these might affect the growth of planets. Standard planet-hunting techniques generally don't work well with these stars, but, in 2005, an astronomer found evidence for a planet candidate in one such multiple-star system http://www.jpl.nasa.gov/news/news.cfm?release=2005-115 Trilling and his colleagues used Spitzer's infrared, heat-seeking eyes to look not for planets, but for dusty disks in double-star systems. These so-called debris disks are made up of asteroid-like bits of leftover rock that never made it into rocky planets. Their presence indicates that the process of building planets has occurred around a star, or stars, possibly resulting in intact, mature planets. In the most comprehensive survey of its kind, the team looked for disks in 69 binary systems between about 50 and 200 light-years away from Earth. All of the stars are somewhat younger and more massive than our middle- aged sun. The data show that about 40 percent of the systems had disks, which is a bit higher than the frequency for a comparable sample of single stars. This means that planetary systems are at least as common around binary

stars as they are around single stars. In addition, the astronomers were shocked to find that disks were even more frequent (about 60 percent) around the tightest binaries in the study. These coziest of stellar companions are between zero and three astronomical units apart. Spitzer detected disks orbiting both members of the star pairs, rather than just one. Extra-tight star systems like these are where planets, if they are present, would experience Tatooine-like sunsets.

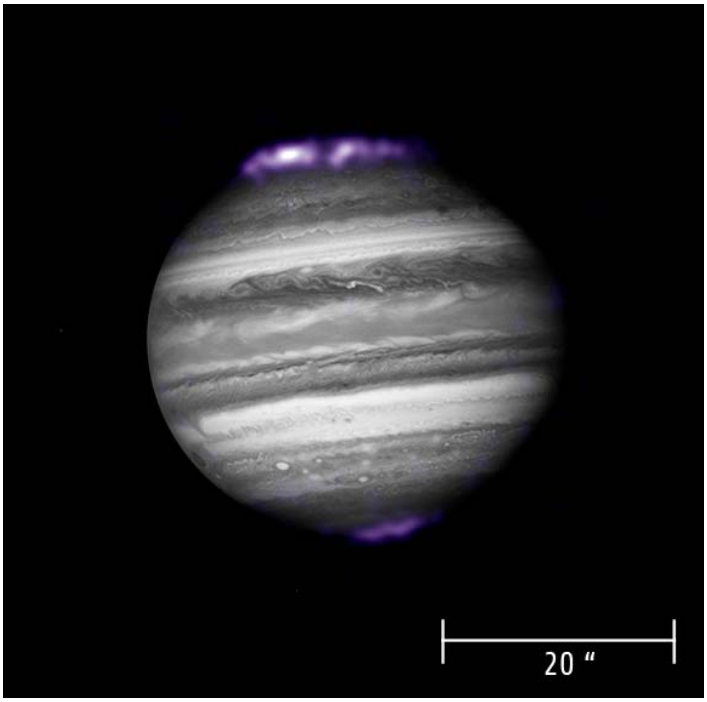
"*We were very surprised to find that the tight group had more disks*," said Trilling. "*This could mean that planet formation favors tight binaries over single stars, but it could also mean tight binaries are just dustier. Future observations should provide a better answer*."

The Spitzer data also reveal that not all binary systems are friendly places for planets to form. The telescope detected far fewer disks altogether in intermediately spaced binary systems, between three to 50 astronomical units apart. This implies that stars may have to be either very close to each other, or fairly far apart, for planets to arise. "*For a planet in a binary system, location is everything*," said co-author Karl Stapelfeldt. "*Binary systems were largely ignored before*," added Trilling. "*They are more difficult to study, but they might be the most common sites for planet formation in our galaxy*." www.spitzer.caltech.edu/Media and http://www.nasa.gov/spitzer

BIG AURORAS ON JUPITER

So you thought Northern Lights were big in Alaska? "*That's nothing*," says Randy Gladstone. "*Jupiter has auroras bigger than our entire planet*." Last month, Gladstone and colleagues used Chandra X-ray Observatory to capture a picture: http://chandra.harvard.edu/photo/2007/jupiter/ of X-ray auroras observed by the Chandra X-ray Observatory overlaid on a simultaneous optical image from the Hubble Space Telescope.

The purple ring traces Jupiter's X-ray auroras. Gladstone calls them "*Northern Lights on steroids. They're hundreds of times more energetic than auroras on Earth*." Chandra has observed Jupiter's auroras many times before, but this recent dataset is exceptional both in length and quality. Gladstone hopes it will help him solve some mysteries lingering for almost 30 years. Jupiter's auroras were discovered by the Voyager 1 spacecraft in 1979. A thin ring of light on Jupiter's nightside looked like a stretched-out version of our own auroras on Earth. But those early photos merely hinted at the power involved. The real action, astronomers soon learned, was taking place at high-energy wavelengths invisible to the human eye. In the 1990s, ultraviolet cameras on the Hubble Space Telescope photographed raging lights thousands of times more intense than anything ever seen on Earth, while X-ray observatories saw auroral bands and curtains bigger than Earth itself.



Jupiter's hyper-auroras never stop. "*We see them every time we look,"* says Gladstone. You don't see auroras in Alaska every time you look, yet on Jupiter the Northern Lights always seem to be "on." Gladstone explains the difference: On Earth, the most intense auroras are caused by solar storms. An explosion on the sun hurls a billion-ton cloud of gas in our direction, and a few days later, it hits. Charged particles rain down on the upper atmosphere, causing the air to glow red, green and purple. On Jupiter, however, the sun is not required. "*Jupiter is able to generate its own lights*," says Gladstone.

The process begins with Jupiter's spin: The giant planet turns on it axis once every 10 hours and drags its planetary magnetic field around with it. As any science hobbyist knows, spinning a magnet is a great way to generate a few volts - it's the basic principle of DC motors. Jupiter's spin produces 10 million volts around its poles. "*Jupiter's polar regions are crackling with electricity*," says Gladstone, "*and this sets the stage for non-stop auroras*." The polar electric fields grab any charged particles they can find and slam them into the atmosphere.

Particles for slamming can come from the sun, but Jupiter has another, more abundant source nearby: the volcanic moon Io, which spews oxygen and sulfur ions (O+ and S+) into Jupiter's spinning magnetic field. Somehow, these ions make their way to Jupiter's poles where electric fields send them hurtling toward the planet below. Upon entering the atmosphere, "*their electrons are first stripped away by molecules they run into, but as they slow down they start grabbing electrons back. The 'charge exchange reaction' produces intense X-ray auroras*," he explains. So Jupiter's Northern Lights are, in a sense, volcano powered.

Mystery solved? Not quite. No one knows exactly how volcanic exhaust meanders from Io out through Jupiter's magnetosphere and back to Jupiter's poles. "*We're still trying to figure it out*," says

Gladstone. But that is a minor detail compared to another, even bigger puzzle: There is an X-ray "pulsar" inside Jupiter's northern auroras. Sometimes Chandra sees it, sometimes not. When it's on, the pulsar emits gigawatt bursts of X-rays with a regular beat of 45 minutes. Gladstone suspects the pulsar has nothing to do with Io's volcanoes, but instead is caused by the sun. "*Maybe Jupiter's magnetic field, when it gets hit by a solar wind gust, rings like a bell with a 45-minute period*," he speculates. "*There are many other possibilities as well*." The February 2007 dataset may hold important clues. "*Chandra observed the auroras for 15 hours, and we weren't the only ones watching*," he says. The Hubble Space Telescope, the FUSE satellite, XMM-Newton (a European X-ray observatory), the New Horizons spacecraft and many ground-based observatories were all taking data at the same time. The campaign was timed to coincide with New Horizons flyby of Jupiter - a slingshot maneuver designed to increase its velocity en route to Pluto. "*Jupiter's auroras have never been observed by so many telescopes at once*," says Gladstone. "*I'm really excited by these data, and the analysis is just beginning*."
http://science.nasa.gov/headlines/y2007/29mar_bigauroras.htm

PRODUCING COSMIC GAMMA RAYS IN STARBURST REGIONS

Mechanism explains how the most energetic form of light can be produced in areas dominated by bright, young stars In 2002, when astronomers first detected cosmic gamma rays -- the most energetic form of light known -- coming from the constellation Cygnus they were surprised and perplexed. The region lacked the extreme electromagnetic fields that they thought were required to produce such energetic rays. But now a team of theoretical physicists propose a mechanism that can explain this mystery and may also help account for another type of cosmic ray, the high-energy nuclei that rain down on Earth in the billions.

Existing methods for producing cosmic gamma rays require the ultra-strong electromagnetic fields found only in some of the most extreme conditions in the universe, such as stellar explosions and regions surrounding the massive black holes found at the core of many galaxies. So they couldn't explain how a "starburst" region in the Cygnus galaxy dominated by young, hot, bright stars could produce such energetic rays. The newly proposed mechanism, however, shows how two constituents present in such an area -- fast-moving nuclei found in stellar winds and ultraviolet light -- can interact to produce cosmic gamma rays.

Cosmic rays provide an invisible but important link between the Earth and the rest of the universe. They have a number of subtle effects on everyday life. They cause chemical changes in soil and rock and trigger lightning strikes, and some scientists have suggested that they may affect the climate by influencing the process of cloud formation. The circuitry in computer chips is now so small that individual cosmic rays can cause non-reproducible computer errors, and cosmic rays increase the risk of cancer among frequent airline passengers. There is also speculation that waves of cosmic rays streaming down the spiral arms of the galaxy could have contributed to past episodes of mass extinction on earth.

Since cosmic rays were discovered in 1912 in balloon experiments, scientists have marveled at the tremendous amount of energy that they carry and have speculated about their origins. Originally, about all researchers knew about them were that they came from outer space. Today, scientists know that cosmic rays consist of a variety of different objects, including gamma rays, protons, electrons and the nuclei of a wide variety of different elements. They also know more about where cosmic rays come from. Most low-energy cosmic rays are produced by the sun. However, high-energy cosmic rays come from distant parts of the universe.

Despite the years of study, cosmic rays have managed to keep a number of secrets. For example, the most energetic proton-cosmic rays -- nicknamed "Oh-my-God-particles" -- pack a punch equivalent to that of a fast-pitch baseball. In the baseball, billions upon billions of nuclear particles share this energy. These energetic cosmic rays demonstrate that there are ways to pack the same amount of energy into a single particle, but, despite their continuing efforts, scientists have not yet found an acceptable mechanism for doing so.

Another outstanding question is the origin of the most energetic gamma rays. They carry a trillion times more energy than photons in the visible range, making them the most energetic form of light known. (Atomic particles like protons and electrons gain and lose energy by speeding up and slowing down. Light particles, called photons, always travel at the same speed and gain energy by oscillating faster at shorter wavelengths and lose energy by oscillating more slowly at longer wavelengths.) Physicists measure the energy in photons in electron-volts (eV): the amount of energy a single electron gains when it passes through a potential difference of one volt. The energies of photons in visible light range from 1.5 to 3.0 eV. Cosmic gamma rays contain tens of trillions of electron volts. Such TeV gamma rays are relatively rare: one falls on a square kilometer of Earth's atmosphere every second on average. Virtually all of them collide with air molecules and produce a cascade of energetic particles in the upper atmosphere.

Scientists have come up with several mechanisms that can explain how photons can gain so much energy. They do a good job of explaining how TeV gamma rays can be created by the ultra-strong electrical and magnetic fields that occur when stars explode and that are associated with the super-massive black holes found in many galaxies.

One of the generally accepted mechanisms begins with electrons that have been accelerated to extremely high energies. When such an electron runs head on into a microwave photon, it can transfer much of its energy into the photon by a process called

Compton back scattering. In the process, the microwave photon is transformed into a TeV gamma ray. A variation on the theme involves the interaction of a fast-moving electron with an extremely strong magnetic field. The magnetic field throws the electron into a curve. If the curve is sharp enough, the electron will lose energy by emitting high-energy gamma rays: a phenomenon called bremsstahlung.

The second mechanism involves collisions between highly accelerated protons and a photon. In this case, the proton first absorbs the photon. This makes the proton unstable, so it decays into a short-lived subatomic particle called a pion, which, in turn, decays into a pair of cosmic gamma rays. "*There is a region in Cygnus, called Cygnus OB2, where there have been unexplained observations of TeV gamma rays: That is where we jumped in*," says Weiler.

The new mechanism he and his colleagues have worked out uses the strong ultraviolet light produced by young, hot, stars and the nuclei of iron and silicon, which should be present in the stellar winds in starburst regions. Both nuclei carry strong positive electric charges, so they can be accelerated to extremely high velocities by moderate electromagnetic fields. The scientists calculate that when one of these nuclei collides with a photon of ultraviolet starlight, it will frequently disintegrate into a nuclear fragment and some TeV gamma rays.

"*Each of these three mechanisms -- electron versus proton versus nucleus as accelerated beam -- has a characteristic signature in the gamma ray spectrum. Our nuclear mechanism fits the observations from Cygnus OB2 much better than the others*," says Weiler.

The heavy nuclei required in this process are produced in supernovas and there are no known exploded stars in the region. So the model assumes that these nuclei, which are spread throughout space, are sometimes trapped by starburst regions. "*This is one of the weakest parts of our model, so I don't want to push this aspect*," says Weiler. However, if the model is correct then these regions may be an important source of the nuclei fraction of the cosmic rays that fall on Earth. The nuclei that produce the cosmic gamma rays should stream out into the galaxy and some should reach Earth eventually as cosmic rays. Unlike gamma rays, which can be tracked back to their sources, the paths of electrically charged nuclei are altered by the magnetic fields that they pass through so it is not possible to determine their origins directly. http://www.vanderbilt.edu/exploration/text/index.php?action=view_section&id=1178&story_id=284&images=

HINODE REVEALS DETAILED PROCESSES ON THE SUN

NASA has released never-before-seen images that show the sun's magnetic field is much more turbulent and dynamic than previously known. The international spacecraft Hinode, formerly known as Solar B, took the images. Hinode, Japanese for "sunrise," was launched Sept. 23, 2006, to study the sun's magnetic field and how its explosive energy propagates through the different layers of the solar atmosphere. The spacecraft's uninterrupted high-resolution observations of the sun will have an impact on solar physics comparable to the Hubble Space Telescope's impact on astronomy. "*For the first time, we are now able to make out tiny granules of hot gas that rise and fall in the sun's magnetized atmosphere*," said Dick Fisher, director of NASA's Heliophyics Division. "*These images will open a new era of study on some of the sun's processes that effect Earth, astronauts, orbiting satellites and the solar system*." Hinode's three primary instruments, the Solar Optical Telescope, the X-ray Telescope and the Extreme Ultraviolet Imaging Spectrometer, are observing the different layers of the sun. Studies focus on the solar atmosphere from the visible surface of the sun, known as the photosphere, to the corona, the outer atmosphere of the sun that extends outward into the solar system. "*By coordinating the measurements of all three instruments, Hinode is showing how changes in the structure of the magnetic field and the release of magnetic energy in the low atmosphere spread outward through the corona and into interplanetary space to create space weather*," said John Davis, project scientist.

Space weather involves the production of energetic particles and emissions of electromagnetic radiation. These bursts of energy can black out long-distance communications over entire continents and disrupt the global navigational system.

"*Hinode images are revealing irrefutable evidence for the presence of turbulence-driven processes that are bringing magnetic fields, on all scales, to the sun's surface, resulting in an extremely dynamic chromosphere or gaseous envelope around the sun*," said Alan Title. The X-ray Telescope captured the rapid, time-sequenced images of explosive events in the sun's outer atmosphere. "*By following the evolution of the solar structures that outline the magnetic field before, during and after these explosive events, we hope to find clear evidence to establish that magnetic reconnection is the underlying cause for this explosive activity*," said Leon Golub. http://www.nasa.gov/hinode

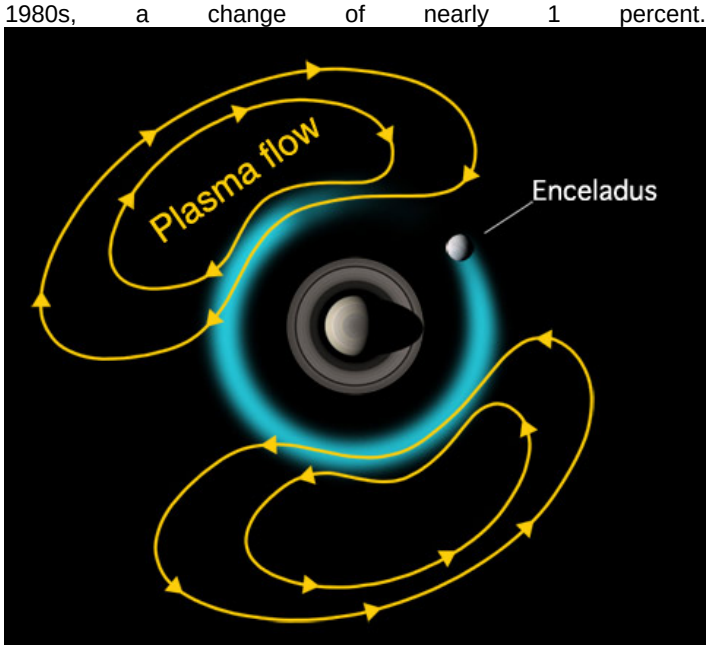
ENCELADUS GEYSERS MASK THE LENGTH OF SATURN'S DAY

In a David and Goliath story of Saturnian proportions, the little moon Enceladus is weighing down giant Saturn's magnetic field so much that the field is rotating slower than the planet. This phenomenon makes it nearly impossible to measure the length of the Saturn day using techniques that work at the other giant planets. "*No one could have predicted that the little moon Enceladus would have such an influence on the radio technique that has been used for years to determine the length of the Saturn day*," said Dr. Don Gurnett. Gurnett is the principal investigator on the radio and plasma wave science experiment onboard Cassini spacecraft. The radio technique measures the rotation of the planet by taking its radio pulse rate -- the rhythm of natural radio signals from the planet.

A new study of Cassini data determined that Saturn's magnetic field lines, invisible lines originating from the interior of a magnetized planet, are being forced to slip relative to the rotation of the planet by the weight of electrically charged particles originating from geysers spewing water vapor and ice from Enceladus. These results are based on joint observations by two Cassini instruments-the radio and plasma wave instrument and the magnetometer. The neutral gas particles ejected from the geysers on Enceladus form a donut-like torus around Saturn. As these particles become electrically charged, they are captured by Saturn's magnetic field, forming a disk of ionized gas, or plasma, which surrounds the planet near the equator. The particles weigh down the magnetic field so much that the rate of rotation of the plasma disk slows down slightly. This slippage causes the radio period, controlled by the plasma disk rotation, to be longer than the planet's actual rotation period.

Scientists conclude the period Cassini has been measuring from radio emission is not the length of the Saturn day, but rather the rotation period of the plasma disk. At present, because of Saturn's cloud motion, no technique is known that can accurately measure the planet's actual internal rotation. Finding out the length of Saturn's day has been a challenge because the gaseous planet

has no surface or fixed point to clock its rotation rate. Initially, the approach was to use periodic regular radio signals, as has been done for Jupiter, Uranus and Neptune. However, Saturn's radio period has turned out to be troubling in two ways. It seems to be a pulsed signal rather than a rotating, lighthouse-like beam. Secondly, the period seems to be slowly changing over months to years. The day measured by Cassini is some six minutes longer than the day recorded by NASA's Voyager spacecraft in the early 1980s, a change of nearly 1 percent.



"*We have linked the pulsing radio signal to a rotating magnetic signal. Once each rotation of Saturn's magnetic field, an asymmetry in the field triggers a burst of radio waves*," said Dr. David Southwood, co-author and director of science at the European Space Agency. "*We have then linked both signals to material that has come from Enceladus*."

Based on the new observations, scientists now think there are two possible reasons for the change in radio period. The first theory is that the geysers on Enceladus could be more active now than in Voyagers' time. The second is that there may be seasonal variations as Saturn orbits the sun once every 29 years. "*One would predict that when the geysers are very active, the particles load down the magnetic field and increase the slippage of the plasma disk, thereby increasing the radio emission period even more. If the geysers are less active, there would be less of a load on the magnetic field, and therefore less slippage of the plasma disk, and a shorter period*," said Gurnett. "*The direct link between radio, magnetic field and deep planetary rotation has been taken for granted up to now. Saturn is showing we need to think further*," said Michele Dougherty, principal investigator on Cassini's magnetometer instrument. http://www.jpl.nasa.gov/news/news.cfm?release=2007-032 The Saturn radio emissions detected by Cassini have been converted into an audio file available at: http://www.nasa.gov/cassini and http://saturn.jpl.nasa.gov .

SCIENTISTS COMPUTE DEATH THROES OF WHITE DWARF IN 3D

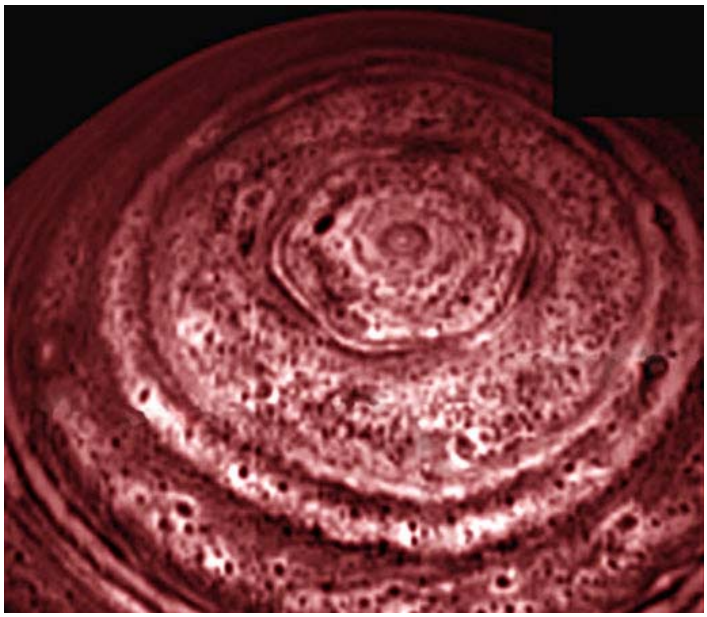
Scientists using computer simulations demonstrate how to incinerate a white dwarf star, in unprecedented detail. White dwarf stars pack one and a half times the mass of the sun into an object the size of Earth. When they burn out, the ensuing explosion produces a type of supernova that astrophysicists believe manufactures most of the iron in the universe. But these type Ia supernovas, as they are called, may also help illuminate the mystery of dark energy, an unknown force that dominates the universe. "*That will only be possible if we can gain a much better understanding of the way in which these stars explode*," said Don Lamb, Director of the Center for Astrophysical Thermonuclear Flashes. The Flash Center has been simulating exploding stars since 1997. Scientists for years have attempted to blow up a white dwarf star by writing the laws of physics into computer software and then testing it in simulations. At first the detonations would only occur if inserted manually into the programs. Then the Flash team naturally detonated white dwarf stars in simplified, two-dimensional tests, but "*there were claims made that it wouldn't work in 3D*," Lamb said. But in January, the team for the first time naturally detonated a white dwarf in a more realistic three-dimensional simulation. The simulation confirmed what the team already suspected from previous tests: that the stars detonate in a supersonic process resembling diesel-engine combustion. Unlike a gasoline engine, in which a spark ignites the fuel, compression triggers ignition in a diesel engine. "*You don't want supersonic burning in a car engine, but the triggering is similar*," said Dean Townsley.

The temperatures attained by a detonating white dwarf star makes the 10,000-degree surface of the sun seem like a cold winter day in Chicago by comparison. "*In nuclear explosions, you deal with temperatures on the order of a billion degrees*," said Cal Jordan. The new 3D white dwarf simulation shows the formation of a flame bubble near the center of the star. The bubble, initially measuring approximately 10 miles in diameter, rises more than 1,200 miles to the surface of the star in one second. In another second, the flame crashes *into itself on the opposite end of the star, triggering a detonation. "It seems that the dynamics of the collision is what creates a localized compression region where the detonation will manifest*," Townsley said. This process plays out in no more than three seconds, but the simulations take considerably longer. The team ran its massive simulation on two powerful supercomputers at Lawrence Livermore and Lawrence Berkeley national laboratories in California. Just one of the jobs ran for 75 hours on 768 computer processors, for a total of 58,000 hours. "*Without their help, we would never have been able to do the simulations*." The simulations are so demanding -- the Flash team calls it "extreme computing" -- that they monopolize powerful computers of the national lab during the allocated time. To ensure that these computers are used to their maximum potential, the team stands on alert to rapidly correct any glitches that may arise. "*We have it set up so that if something goes wrong, text messages are sent out instantaneously to everyone*," said research scientist Robert Fisher. "*It's like being a doctor on call 24/7*." But the scientific payoff for logging these long, stressful hours is potentially huge. Astrophysicists value type Ia supernovas because they all seem to explode with approximately the same intensity. Calibrating these explosions according to their distance reveals how fast the universe has been expanding at various times during its long history. In the late 1990s, supernova measurements revealed that the expansion of the universe is accelerating. Not knowing what force was working against gravity to cause this expansion, scientists began calling it "dark energy." The simulations may help astrophysicists make better calibrations to adjust for the minor variation that they believe occurs from one supernova to the next. "*To make extremely precise statements about the nature of dark energy and cosmological expansion, you have to be able to understand the nature of that variation*," Fisher said. Telescopic images of the two supernovas closest to Earth seem match the team's findings. The images of both supernovas show a sphere with a cap blown off the end. "*In our model, we have a rising bubble that pops out*

of the top. It's very suggestive," Jordan said. http://www-news.uchicago.edu/releases/07/070322.explodingstars.shtml

CASSINI IMAGES BIZARRE HEXAGON ON SATURN

An odd, six-sided, honeycomb-shaped feature circling the entire north pole of Saturn has captured the interest of scientists with the Cassini mission. The Voyager 1 and 2 spacecraft imaged the feature over two decades ago. The fact that it has appeared in Cassini images indicates that it is a long-lived feature. A second hexagon, significantly darker than the brighter historical feature, is also visible in the Cassini pictures.



The spacecraft's visual and infrared mapping spectrometer is the first instrument to capture the entire hexagon feature in one image. "*This is a very strange feature, lying in a precise geometric fashion with six nearly equally straight sides*," said Kevin Baines, atmospheric expert and member of Cassini's visual and infrared mapping spectrometer team at JPL. "*We've never seen anything like this on any other planet. Indeed, Saturn's thick atmosphere where circularly-shaped waves and convective cells dominate is perhaps the last place you'd expect to see such a six-sided geometric figure, yet there it is*." The hexagon is similar to Earth's polar vortex, which has winds blowing in a circular pattern around the polar region. On Saturn, the vortex has a hexagonal rather than circular shape. The hexagon is nearly 25,000 kilometers (15,000 miles) across. Nearly four Earths could fit inside it. The new images taken in thermal-infrared light show the hexagon extends much deeper down into the atmosphere than previously expected, some 100 kilometers (60 miles) below the cloud tops. A system of clouds lies within the hexagon. The clouds appear to be whipping around the hexagon like cars on a racetrack. "*It's amazing to see such striking differences on opposite ends of Saturn's poles*," said Bob Brown, team leader of the Cassini visual and infrared mapping spectrometer. "*At the south pole we have what appears to be a hurricane with a giant eye, and at the north pole of Saturn we have this geometric feature, which is completely different*."

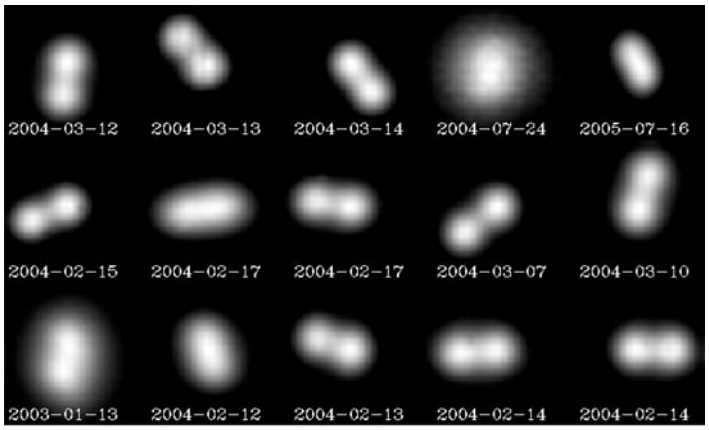
The Saturn north pole hexagon has not been visible to Cassini's visual cameras, because it's winter in that area, so the hexagon is under the cover of the long polar night, which lasts about 15 years. The infrared mapping spectrometer can image Saturn in both daytime and nighttime conditions and see deep inside. It imaged the feature with thermal wavelengths near 5 microns (seven times the wavelength visible to the human eye) during a 12-day period beginning on Oct. 30, 2006. As winter wanes over the next two years, the feature may become visible to the visual cameras. Based on the new images and more information on the depth of the feature, scientists think it is not linked to Saturn's radio emissions or to auroral activity, as once contemplated, even though Saturn's northern aurora lies nearly overhead. The hexagon appears to have remained fixed with Saturn's rotation rate and axis since first glimpsed by Voyager 26 years ago. The actual rotation rate of Saturn is still uncertain. "*Once we understand its dynamical nature, this long-lived, deep-seated polar hexagon may give us a clue to the true rotation rate of the deep atmosphere and perhaps the interior*," added Baines. The hexagon images and movie, including the north polar auroras are available at: http://www.nasa.gov/cassini http://wwwvims.lpl.arizona.edu http://www.jpl.nasa.gov/news/news.cfm?release=2007-034

AMATEUR ASTRONOMERS, PROFESSIONALS COMBINE TO PRODUCE DETAILED PICTURE OF DOUBLE ASTEROID

Roping together observations from the world's largest telescopes as well as the small instrument of a local backyard amateur, astronomers have assembled the most complete picture yet of a pair of asteroids whirling around one another in a perpetual pas de deux. In a paper to be published in the April 2007 issue of the journal Icarus, a team of University of California, Berkeley, and Paris Observatory astronomers depict the asteroid 90 Antiope as two slightly egg-shaped rubble piles locked in orbit, like two twirling dancers facing one another with linked arms. This new view of Antiope is the culmination of research that started in 2003 and that eventually included data supplied by both professional and amateur astronomers from around the globe. Before the year 2000, Antiope was just another main-belt asteroid, one of millions between the orbits of Mars and Jupiter. But that year, it was resolved into a doublet, thanks to sharper pictures obtained with adaptive optics (AO) on the largest ground-based telescope, the 10-meter Keck II telescope in Hawaii. Yet, even with AO, these two asteroids were too small for astronomers to discern their shape or to see more than two bright blobs revolving around their center of mass. Two years ago, with improved images from the ESO's 8-meter Very Large Telescope (VLT) in Chile and Keck II, astronomer Franck Marchis and colleagues in France were able to determine the orbits of the two asteroids, each of them about 86 kilometers in diameter and separated by about 171 kilometers.

But uncertainties remained, and in 2005 the team invited observers around the world to turn their telescopes on the asteroid pair during a time when they predicted a mutual eclipse or occultation would cause a drop in brightness. In an eclipse, one of the pair casts a shadow over the other; in an occultation, one passes in front of, and completely blocks light from, the other. Sure enough, at the appointed time on May 31, 2005, one of the asteroids eclipsed the other, and team member Tadeusz Michalowski e-mailed Marchis and their colleagues from South Africa to confirm the eclipse. Michalowski recorded the dip in Antiope's brightness from the South African Astronomical Observatory. Over the next six months, at Marchis' invitation, amateurs and professionals from as far afield as Brazil, France, Reunion Island in the Indian Ocean and Grass Valley, Calif., observed repeated occultations, as well as shadows passing over one of the pair. "*This is the first publication I've had in a professional journal, and I'm really happy about it*," said amateur astronomer Peter Dunckel, 75, a retired paper company executive who observes from the backyard of his vacation home in Grass Valley. "*What is really a thrill is to have my little 7-inch telescope*

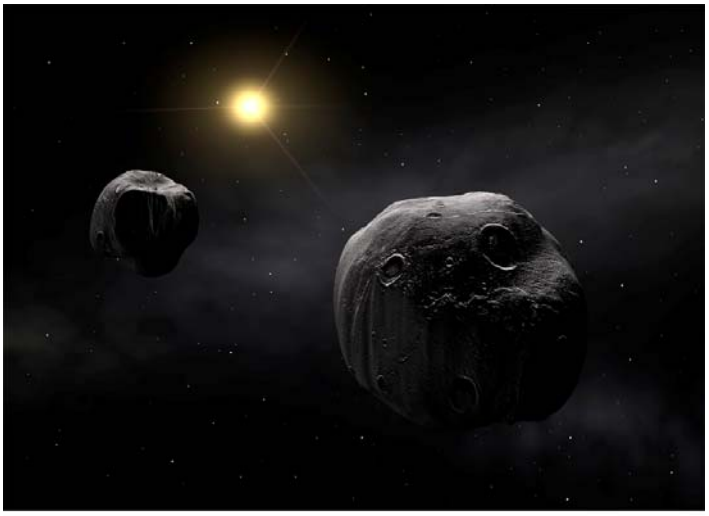
along with an 8- meter telescope on the same paper; it is unbelievable." Dunckel observed the binary pair for 35 hours over a period of six weeks, recording Antiope's brightness every minute with a CCD camera attached to his Maksutov Newtonian reflector telescope.



The Double Asteroid (90) Antiope
(NACO/VLT)

ESO Press Photo 18b/07 (29 March 2007)

"*Amateurs can be used for professional studies, compensating for the small size of their telescopes by the large numbers of observations and the frequency of observations they can do*," Marchis said. "*You can time the orbits more precisely when a mutual event happens, which allows you to extract also the size, shape and surface detail of each component, and also what it's made of*." The asteroid pair is itself the remnant of an ancient asteroid, dubbed Themis, which astronomers estimate was destroyed around 2.5 million years ago, probably hit by another asteroid. The rubble spread out from the point of impact but continued to follow approximately the same orbit around the sun in the outer part of the main asteroid belt. Themis was a carbonaceous chondrite left over from the formation of the solar system 2.5 billion years ago. Evidently, either another asteroid hit Antiope again to split it in two, or two of the Themis pieces remained bound to one another after the initial break up, possibly even remaining attached. However the doublet arose, computer simulations by another group suggest that the spinning, elongated rubble pile would have separated into two egg-shaped rubble piles, each the shape of a Roche ellipsoid, the theoretical shape predicted for a system if their composition was liquid or loosely aggregated, rather than solid, and if the components are deformed due to mutual gravitation. The eclipse and occultation observations, combined with previous observations of Antiope during a grazing occultation, confirmed the ellipsoid shape of each component of the asteroid, Marchis said. Each component differs from a sphere by less than 7 percent, or 6 kilometers out of 86. They orbit around their center of mass every 16.5 days "*Due to mutual gravitation, both components took a shape very close to the pure hydrostatic shape, the Roche ellipsoid, as if the asteroid was a fluid*," Marchis said. "*This result indicates that the internal strength in the components must be low, so possibly a rubble pile structure*." They were able to calculate the density as 1.25 grams per cubic centimeter (water is one gram per cubic centimeter), which, if one assumes that the rock component is carbonaceous chondrite, means the asteroid pair is 30 percent empty space. "*Despite this intensive study, the origin of this unique doublet still remains a mystery*," said team member Pascal Descamps. "*The formation of such a large double system is an improbable event and represents a formidable challenge to theory. It is possible that a parent body was spun up so much that it broke apart, but this seems very hard to do for asteroids in the main belt, unlike, for example, near- Earth asteroids*." Marchis and his team are employing both amateur and professional astronomers to observe more of these mutual events between components of binary asteroid systems. These partnerships are a powerful way to get direct and accurate insights about these systems, he said.



The Antiope Doublet
(Artist's Impression)

ESO Press Photo 18a/07 (29 March 2007)

As for Dunckel, who commutes from San Francisco to the Grass Valley vacation home he refers to as "Rattlesnake Creek Observatory," he says he's hooked on scientific amateur observing, "*now that I've broken the dam, so to speak*." He has upgraded to a 10-inch reflecting telescope and is excited about applying a new computer program that will allow him to create 3D models of asteroids from light curves he obtains in collaboration with others. http://www.berkeley.edu/news/media/releases/2007/03/29_antiope.shtml . images http://www.eso.org/outreach/press-rel/pr-2007/pr-18-07.html

SPACE OBSERVATORIES CATCH MAGNETAR IN GIANT BELCH

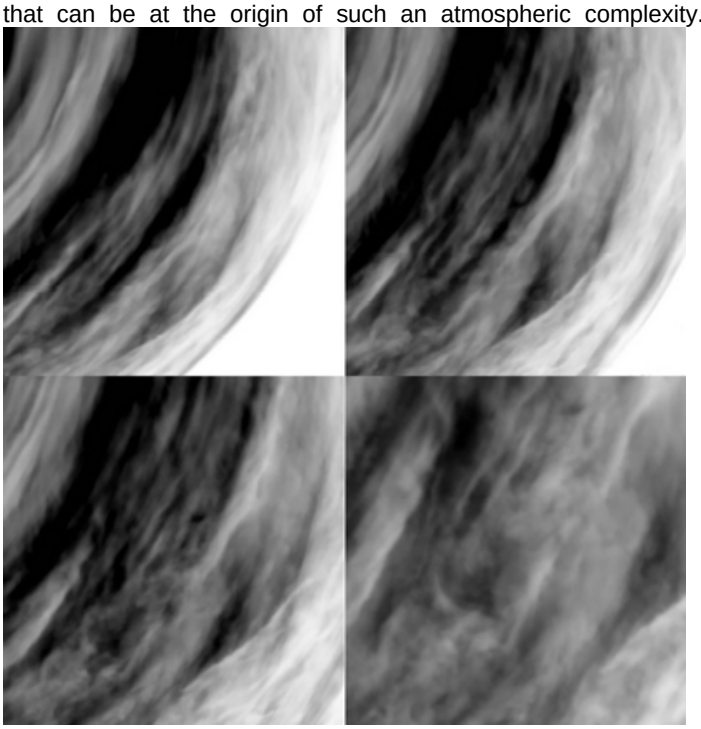
When it comes to eerie astrophysical effects, the neutron stars commonly known as magnetars are hard to beat. The massive remnants of exploded stars, magnetars are the size of mountains but weigh as much as the sun, and have magnetic fields hundreds of trillions of times more powerful than the earthly field that turns our compass needles north. Now astrophysicists have managed to catch a recently discovered magnetar in a sort of giant cosmic hiccup that still has them puzzled. The researchers describe the behavior of the body located in a star cluster about 15,000 light-years away in the Ara constellation in the southern hemisphere. The magnetar goes by the unwieldy official name CXOU J164710.2-455216, or more informally, the "Westerlund 1 magnetar." "*We only know of about a dozen magnetars*," says Michael Muno, a scientist at the Caltech Space Radiation Laboratory, and the original discoverer of the magnetar. "*In brief, what we observed was a seismic event on the magnetar, which tells us a lot about the stresses these objects endure*." In September 2005, about a year after Muno found the magnetar, the object produced a burst that luckily came at a time when it was being heavily observed by several satellites, including the Swift X-ray and gamma-ray observatory, and the ESA's X-ray satellite, XMM-Newton. Just five days before the burst, Muno and collaborators had been looking at the magnetar with the XMM-Newton and seen it in the relatively calm state in which he had originally found it. As most magnetars do, it produced a beam of

X-ray light that, like the beam from a lighthouse, swept across Earth once every 10 seconds. This allowed its rotational rate to be determined very precisely. The event that produced the burst also caused the magnetar to shine 100 times more brightly, created three separate beams to sweep past Earth where previously only one had existed, and sped up its rotation rate by about a thousandth of a second. Muno says more work is required to understand what happened with the magnetar, because it is built of matter far denser than anything on Earth, and its composition is still a mystery. However, it is possible to make educated guesses by extending theories developed to explain other neutron stars. The magnetic fields inside the neutron star are probably wound up, like a twisted spring. In a manner somewhat similar to plate tectonics here on Earth, as the magnetic fields unwind, they put stress on the outer crust. The crust would resist these stresses for a while, but would eventually fracture, producing a seismic event. The fractures would cause the magnetar's surface to shine brightly from multiple sources. Also, there is reason to think that part of the interior of the neutron star is liquid and may be rotating faster than the crust. The seismic event could cause this fluid to become attached to the crust, so that the outer crust would speed up slightly. "*So we think the crust cracked*," Muno says, adding that the observations are important for two reasons. "*First, we have now seen another way in which these exotic objects dissipate their internal fields as they age. "Second, this event was only spotted because a team of us were concentrating hard on this newly discovered object*," he adds. "*The fact that we saw the event only a year after we discovered the magnetar implies that dozens more could be lurking in our galaxy*." "*If we find many more of these magnetars, we will have to reevaluate our understanding of what happens when stars die*," says GianLuca Israel, an Italian astronomer who is publishing a separate paper on the magnetar with his collaborators.

TRACKING TURBULENCE WITH VENUS EXPRESS

New images and data from ESA's Venus Express mission to Venus provide new insights into the turbulent and noxious atmosphere of Earth's sister planet. What causes violent winds and turbulences? Is the surface topography playing a role in the complex global dynamics of the atmosphere? Venus Express is on the case. Venus' atmosphere represents a true puzzle for scientists. Winds are so powerful and fast that they circumnavigate the planet in only four Earth days - the atmospheric "super-rotation" - while the planet itself is very slow in comparison, taking 243 Earth days to perform one full rotation around its axis. At the poles things get really complicated with huge double-eyed vortices providing a truly dramatic view. In addition, a layer of dense clouds covers the whole planet as a thick curtain, preventing observers using conventional optical means from seeing what lies beneath. Venus Express is on the contrary capable of looking through the atmosphere at different depths, by probing it at different infrared wavelengths. The Ultraviolet, Visible and Near-Infrared Mapping Spectrometer (VIRTIS) on board is continuing its systematic investigation of Venus' atmospheric layers to solve the riddle of the causes for such turbulent and stormy atmosphere. The VIRTIS images focus on Venusian atmospheric turbulences and cloud features, whose shape and size vary with planetary latitudes. At the equator, clouds are irregular and assume a peculiar "bubble"-shape. At mid latitudes they are more regular and streaky, running almost parallel to the direction of the super rotation with speed reaching more than 400 kilometers per hour. Going higher up in latitude, in the polar region, the clouds end up in entering a vortex shape.

With its multi-wavelength eyes, VIRTIS can observe the atmosphere and the cloud layers not only at different depths, but also both in the day- and night-side of the planet - a characteristic that allows an overall assessment of the "environmental" causes that can be at the origin of such an atmospheric complexity.



At the equator, the extremely violent winds of the super-rotation are in constant "battle" with other kinds of local turbulences, or "regional" winds, creating very complex cloud structures. One type of regional wind is due to the strong flux of radiation from the Sun reaching the atmosphere of the planet on the day-side. This flux heats up the atmosphere creating convective cells, where masses of warm air move upwards and generate local turbulence and winds. On the night-side there is obviously no flux from the Sun, but the clouds' shape and the wind dynamics are somehow similar to that we see on the day-side. So, scientists are currently trying to understand if there is any mechanism other than "convection" responsible for the equatorial turbulences, both on the day- and night-side of Venus. For instance, VIRTIS imaged clouds over Alpha Regio, an area close to the equator. This area is characterized by a series of troughs, ridges, and faults that are oriented in many directions, with surface features that can be up to 4 kilometers high. There might be a connection between the surface topography and the local atmospheric turbulence which is observed in this area. This and other hypotheses are being investigated by the Venus Express science teams using data from several instruments. Actually, the Venusian topography may play an important role also in the global atmospheric dynamics. Understanding this surface-atmosphere connection is one of the major objectives of Venus Express - something to be verified in the whole course of the mission. http://www.esa.int/SPECIALS/Venus_Express/SEM9N77DWZE_0.html

FROM THE EDITOR'S TERMINAL

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

The Star Gazer
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In April's StarGazer:

****** ASTRO CALENDAR – STAR PARTY SCHEDULE – WESTERN US 2007 STAR PARTIES**
****** OBSERVER'S INFORMATION**
****** SPITZER FINDS PLANETS THRIVE AROUND STELLAR TWINS**
****** BIG AURORAS ON JUPITER**
****** PRODUCING COSMIC GAMMA RAYS IN STARBURST REGIONS**
****** HINODE REVEALS DETAILED PROCESSES ON THE SUN**
****** ENCELADUS GEYSERS MASK THE LENGTH OF SATURN'S DAY**
****** SCIENTISTS COMPUTE DEATH THROES OF WHITE DWARF IN 3D**
****** CASSINI IMAGES BIZARRE HEXAGON ON SATURN**
****** AMATEUR, PROFESSIONALS COMBINE TO PRODUCE DETAILED PICTURE OF DOUBLE ASTEROID**
****** SPACE OBSERVATORIES CATCH MAGNETAR IN GIANT BELCH**
****** TRACKING TURBULENCE WITH VENUS EXPRESS**

The next EAS Meeting is 3:00 P.M. Saturday April 14th at the Everett Public Library Auditorium.