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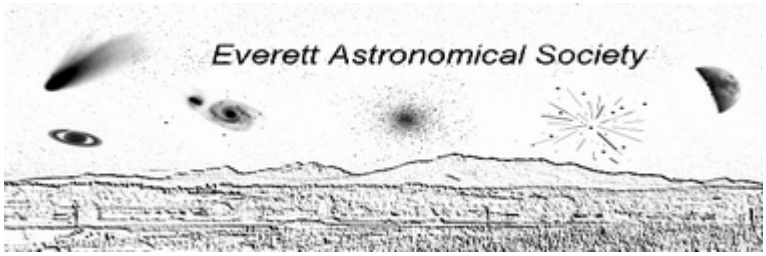
Volume MMVI. No. 2



The Stargazer

February 2006

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

EAS BUSINESS…

NEXT (THE FEBRUARY) EAS MEETING - SATURDAY MARCH 4TH AT 3:00 PM AT THE EVERETT PUBLIC LIBRARY, IN THE AUDITORIUM (DOWNSTAIRS)

Note: Two meetings in March !
March 4th (February's) meeting – 3:00 PM
"Stephan Hawking Universe – On the Dark Side"
March 25th (March's) meeting – 3:00 PM

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

CLUB STAR PARTY INFO

Upcoming star party schedule – In hibernation for the winter.

People should send mail to the mail list 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 Mike Locke at (425) 259-5995 for info or check the EAS website.) Members contact Mike Locke for scope borrowing.

Yakima Messier Marathon – Info from Bruce Perrault of YAS

"I am enclosing a news article on our [YVAS] Messier Marathon. Some of the Seattle members are interested in doing this, so I thought I would sent it to your [Anacortes] club also. We have held events there before and this is a nice dark site with good facilities. It can only handle 100-200 people, though. I have included some information on the Yakima Astronomical Societies annual Messier Marathon. This should answer most of your questions about it, but feel free to ask me more. I will also send this to a couple of the other clubs in the area.

The YVAS Messier Marathon will be held March 25th & 26th from Saturday afternoon until late Sunday Morning. That way anyone that wants to get some sleep before leaving can. It will be held at the Ahtanum Mission Park. The Ahtanum mission is a state historical site run by the Catholic Church. It has some 130 year old apple trees planted by missionary priests in the 1800's. They have put in a nice modern clean restroom facility with running water. The park is located next to Ahtanum Creek and joins the Yakima Indian reservation across the creek. There are plenty of trees, dark skies and room. A nice open field is on the West end where we can set up telescopes and have a fairly open view of the sky. It is quite dark out there, as you are toward the mountains from Yakima.

It is theoretically possible to view all the Messiers, except M30, but getting 100 would be a pretty good accomplishment. I have a check sheet we use on our website set up by the hour. You get a 2 hour break at midnight to let more objects rise in the East.

Directions: 17740 Ahtanum Rd, Yakima WA 98903. It is located a little East of the Tampico store. Best way to come will be to take the Valley Mall Blvd exit from the freeway and go West about a mile to the 3rd ave stoplight. Turn left and go to Ahtanum Road, then right about 12 miles to the Mission.

http://www.perr.com/messier.html

The Mission is a private park and does charge admission. They have 8 RV sites with power available, so let me know if you want to reserve one. Below are the admission charges which you will pay upon arrival. No pre- registration is required, except I would like to know how many RV's would like to come and if you would let me approximately how many in your club are interested, we can plan ahead.

$1.00 per person
$5.00 per tent
$10.00 per RV hookup

The one rule that we need to be careful of, because it has been a wet year, is do not drive on the soft grass. In other words stay on the gravel driveways with vehicles. Normal park rules would also apply, no alcohol, guns etc. The caretaker is a really nice guy, but he is also a Yakima County Sheriff.

The weather can be quit variable in the early Spring and is usually in the 20's at night if the sky is clear, so dress warm. We have both a local weather link and sky clock on the YAS website, so keep an eye on these as the 25th approaches. So come join us and lets all have a good time viewing under dark skies" - Bruce Perrault - http://www.perr.com/yvac.html

$$ - Financial Health - $$

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

Club Scopes

Scope	Loan Status	Waiting
10-inch Dobsonian	On loan	No wait list

EAS members: contact Mike Locke at (425) 259-5995 or 'mlocke at lionmts.com' to borrow a scope.

Astro Calendar for 2005

March 2006

Mar 04 – February EAS Meeting – 3:00 PM at Everett Public Library
Mar 1-30 Saturn in Conjunction with M44 Beehive cluster
Mar 13 - 20th Anniversary (1986), Giotto, Comet Halley Flyby
Mar 14 - Penumbral Lunar Eclipse
Mar 20 - Vernal Equinox, 18:26 UT
Mar 20 - Earth Day
Mar 25 - 10th Anniversary Comet Hyakutake Near-Earth Flyby (0.1 AU)
Mar 25 – March EAS Meeting – 3:00 PM at Everett Public Library
Mar 25/26 – YVAS Messier Marathon Star Party - Ahtanum Park
Mar 29 - Solar Eclipse (Visible From North Africa & Central Asia)

April 2006

Apr 16 - Easter Sunday
Apr 22 - Lyrids meteor shower peak
Apr 22 – April EAS Meeting – 3:00 PM at Everett Public Libary
Apr 27-30 OAS Camp Delaney Spring Star Party – EAS invited
Apr 29 – April EAS Meeting – 3:00 PM at Everett Public Library

May 2006

May 04 - Jupiter at Opposition
May 04 – Astronomy Day Star Party at Harborview Park
May 05 - Astronomy Day at the Everett Library
May 05 – Astronomy Day Star Party at Harborview Park
May 05 - Eta Aquarids meteor shower peak
May 14 - Griffith Observatory reopens

June 2006

Jun 21 - Summer Solstice, 12:26 UT

UW Astronomy 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).

Over The Airwaves

"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 Library – Book & Video List

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

MEMBERSHIP BENEFITS & INFORMATION

Membership in the **Everett Astronomical Society** (EAS) will give you access to all the material in the lending library. The library, which is maintained by Mike Locke, consists of several VCR tapes, many books, magazines, and software titles. Membership includes invitations to all of the club meetings and star parties, plus the monthly newsletter, ***The Stargazer.*** In addition you will be able subscribe to ***Sky and Telescope*** for $7 off the normal subscription rate, contact the treasurer for more information. Link to registration form: 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 will renew your *Sky and Telescope* subscription for you. **Astronomy** magazine offers a similar opportunity to club members.)

EAS is a member of the **Astronomical League** and you will receive the Astronomical League's newsletter, ***The Reflector***. Being a member also allows you the use of the club's telescopes, an award winning 10 inch Dobsonian mount reflector. Contact Mike Locke (425) 259-5995 to borrow a telescope. EAS dues are $25.
Send your annual dues to the **Everett Astronomical Society**, P.O. Box 12746, Everett, WA 98206. Funds obtained from membership dues allows the Society to publish the newsletter, pay Astronomical League dues and maintain our library.

OBSERVER'S INFORMATION…

Lunar Facts

Mar 06	First Quarter Moon
Mar 14	Full Moon
Mar 22	Last Quarter Moon
Mar 29	New Moon
Apr 05	First Quarter Moon
Apr 13	Full Moon
Apr 21	Last Quarter Moon
Apr 27	New Moon
May 05	First Quarter Moon
May 13	Full Moon
May 20	Last Quarter Moon
May 27	New 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	**6:51 am**	**12:21**	**17:53**	**Aqr**	**-27**
Mercury	Daylight	Daylight	**19:15**	**Psc**	**+1.5**
Venus	**04:52 am**	Daylight	Daylight	**Cap**	**-4.6**
Mars	Daylight	**17:42**	**2:10 am**	**Tau**	**+0.8**
Jupiter	**23:54**	**4:29 am**	Daylight	Lib	**-2.2**

Saturn	Daylight	**21:51**	**5:53 am**	**Can**	**-0.1**
Uranus	Daylight	Daylight	Daylight	Aqr	+5.8
Neptune	**6:09 am**	Daylight	Daylight	**Cap**	**+8.0**
Pluto	**02:34 am**	**7:08 am**	Daylight	**Ser**	**+13.9**

(times local time for Everett PST)

Transit times for Jupiter's Great Red Spot in 2006
http://skyandtelescope.com/observing/objects/planets/article_107_2.asp

RS Ophiuchi outburst
This is a rare event - The last time RS Oph went nova was 1985. It has a very unusual spectrum. It has brightened from Magnitude 11 to 5. RS Oph is a close-orbiting binary pair: a red giant star, and a small blue star. Matter from the diffuse red star has been accreting on the surface of the dense blue star, and periodically builds up and explodes. RS Oph may produce light echoes like those captured by Hubble from V838 Monocerotis a few years back.

Supernova in Messier 100
A Type 1A supernova was detected in the nearby galaxy M100 in the Virgo Cluster of Galaxies. It's expected to brighten up to Magnitude 12, which will make it will visible in 6-inch telescopes. Type 1A supernovae are important "standard candles" for judging the scale of the universe, and Messier 100 is close enough to us for the Hubble Space Telescope to image Cepheid variable stars and compare their brightness to that of the supernova

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

MEMBER NEWS

Seattle Astro Society Trying To Get a Dark Sky Site

"We feel that we need to raise $25,000 in order to buy something appropriate on the other side of the mountains. We are making good progress within SAS. The deal basically is $250 for dark sky membership, and some relatively nominal sum for annual dark sky dues. One would have to be a SAS member to do this, but that is a rather nominal charge. We were wondering if anyone in your club would be interested in taking part. I personally think that the dark sky site is a necessary thing for SAS to do; otherwise, the club really has little tangible to offer its members. With a dark sky site, even city-bound members would have a place within a few hours where they could view from a dark site; even us suburban folks would benefit, I think. Thanks for your consideration."
-- Mark de Regt, SAS.

CONSTELLATIONS OF THE MONTH:

LEO (The Lion). One of the 48 "original" constellations. The possessive form of this famous constellation is known as Leonis. Asterisms associated with Leo include The Sickle, The Spring Triangle, and The Diamond (of Virgo). Constellations bordering on Leo (and the directions from Leo) include Cancer(W), Coma Berenices (E), Crater(S), Hydra(S), Leo Minor(N), Sextans (S and W), Ursa Major(N), and Virgo(S and E). The overall brightness (the number of visible stars per unit area = # of visible stars in constellation/size of constellation in square degrees x 100) of Leo is 5.491 (ranking Leo 70th in brightness among the constellations). The central point of Leo is located at RA=10h37m, and Dec. = +13.5 degrees. The size of Leo is 946.96 square degrees (2.296% of the sky), making Leo the 12th largest constellation in area.

Messier objects included within its borders are M65 (spiral galaxy – NGC 3623), M66 (spiral galaxy – NGC 3627), M95 (spiral galaxy – NGC 3351), M96 (spiral galaxy – NGC 3368), and M105 (elliptical galaxy – NGC 3379). Meteor showers (and peaks) associated with Leo are the delta Leonids (Feb. 26), the sigma Leonids (April 17), and the famous Leonids (Nov. 17). The midnight culmination date is March 1st, making Leo a wonderful Spring constellation for observing. The solar conjunction date is August 31st. There are 52 visible stars brighter than magnitude 5.5; some of the famous named stars in Leo include Regulus, Denebola, Algieba, Adhafera, and Chort. Regulus is one of the four Royal Stars of the ancient Persians (the other three are Aldebaran (Taurus), Antares (Scorpius), and Fomalhaut (Piscis Austrinus). Among the nearest stars to our solar system include Wolf 359 (the 4th nearest star), AD Leo (the 37th nearest star), and Ross 104 (the 79th nearest). Wolf 359 has an apparent magnitude of 13.5; an absolute magnitude of 16.5; a parallax (arcsec) of 0.429; and is at a distance of 7.6 light years. Leo is completely visible from latitudes +84 degrees to -57 degrees, and portions of it are visible worldwide.
The Leonid meteor shower (peak Nov. 17th) is unusually active every 33 years. Fantastic and well-known displays were noted in 1799, 1833, 1866, and 1966, with meteors in the tens of thousands reported per hour on these occasions.

YOUNG ASTRONOMER'S CORNER , ASTRONOMY AND TELESCOPE LINGO, PLANETARY FOCUS, ASTRONOMY FUN FACTS, AND MIRROR IMAGES

These columns will return next month.

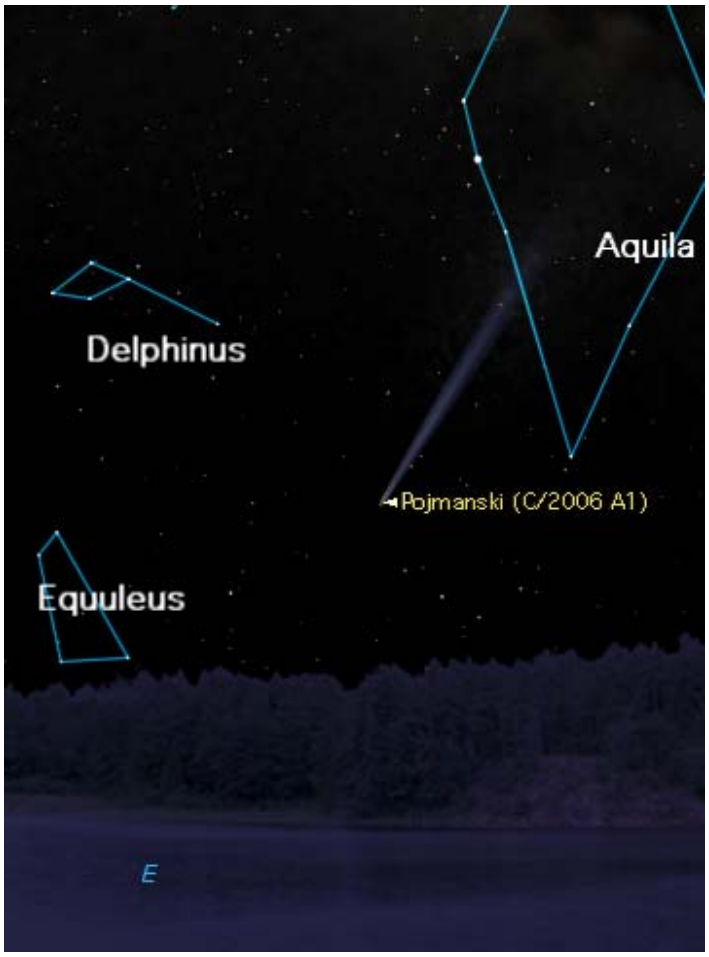
ASTRONOMICAL NOTES -- ON & OFF THE WEB…

COMET POJMANSKI (C/2006 A1)

A newly discovered comet is currently visible in binoculars and even with the naked eye from dark sky locations. At this time, Comet Pojmanski is about at magnitude 5.5. The comet can be seen low on the eastern horizon during morning twilight, from mid-northern latitudes starting, on February 27. It makes its closest approach to Earth on March 5th, and then begins to fade as it moves out of the solar system.

Discovered January 2, by Grzegorz Pojmanski at Warsaw University Astronomical Observatory in Poland, who saw a 12th-magnitude comet on a sky-survey image taken the day before in Chile. The comet was in the constellation Indus far in the southern sky. As astronomers were able to collect more position observations and found the orbit, and it became clear that the object would be heading north in the sky as it passed by the sun.Each day, Comet Pojmanski will rise a little higher and become easier to see from northern latitudes, but also fade. On March 1 it's only 8° above the horizon at the start of dawn as seen from 40° north latitude, but the comet gains altitude every day: to about 20° on March 8. By then, however, it will be starting to fade

rapidly, probably dimming to magnitude 6.2 by March 11 and losing 0.1 magnitude per day thereafter.



JUPITER'S NEW RED SPOT

Backyard astronomers, grab your telescopes. Jupiter is growing a new red spot.

Christopher Go of the Philippines photographed it on February 27th using an 11-inch telescope and a CCD camera:

The official name of this storm is "Oval BA," but "Red Jr." might be better. It's about half the size of the famous Great Red Spot and almost exactly the same color. Oval BA first appeared in the year 2000 when three smaller spots collided and merged. Using Hubble and other telescopes, astronomers watched with great interest. A similar merger centuries ago may have created the original Great Red Spot, a storm twice as wide as our planet and at least 300 years old. Hubble images detail the birth of oval BA in 1997-2000. At first, Oval BA remained white—the same color as the storms that combined to create it. But in recent months, things began to change: "*The oval was white in November 2005, it slowly turned brown in December 2005, and red a few weeks ago*," reports Go. "*Now it is the same color as the Great Red Spot!"*

"*Wow*!" says Dr. Glenn Orton, an astronomer at JPL who specializes in studies of storms on Jupiter and other giant planets. "*This is convincing. We've been monitoring Jupiter for years to see if Oval BA would turn red—and it finally seems to be happening*." (Red Jr.? Orton prefers "the not-so-Great Red Spot.") Why red? Curiously, no one knows precisely why the Great Red Spot itself is red. A favorite idea is that the storm dredges material from deep beneath Jupiter's cloudtops and lifts it to high altitudes where solar ultraviolet radiation--via some unknown chemical reaction—produces the familiar brick color.

Photo - Red spots on Jupiter, photographed by amateur astronomer Christopher Go on Feb. 27, 2006.

"*The Great Red Spot is the most powerful storm on Jupiter, indeed, in the whole solar system*," says Orton. The top of the storm rises 8 km above surrounding clouds. "*It takes a powerful storm to lift material so high*," he adds. Oval BA may have strengthened enough to do the same. Like the Great Red Spot, Red Jr. may be lifting material above the clouds where solar ultraviolet rays turn "chromophores" (color-changing compounds) red. If so, the deepening red is a sign that the storm is intensifying. "*Some of Jupiter's white ovals have appeared slightly reddish before, for example in late 1999, but not often and not for long*," says Dr. John Rogers, author of the book "Jupiter: The Giant Planet," which recounts telescopic observations of Jupiter for the last 100+ years. "*It will indeed be interesting to see if Oval BA becomes permanently red*."

See for yourself: Jupiter is easy to find in the dawn sky. Step outside before sunrise, look south and up: sky map. Jupiter outshines everything around it. Small telescopes have no trouble making out Jupiter's cloudbelts and its four largest moons. Telescopes 10-inches or larger with CCD cameras should be able to track Red Jr. with ease.

AMATEUR ASTRONOMERS MAKE FIRST VISUAL SIGHTING OF '10TH PLANET'

A group of amateur astronomers has used the 2.1-meter (82-inch) Otto Struve Telescope at McDonald Observatory at Fort Davis Texas, to make the first "through-the-eyepiece" sighting of the so-called tenth planet, an object orbiting the Sun in the Kuiper Belt, far beyond Pluto. The group includes members of the St. Louis and Rockland Astronomical Societies, and a few others.

The object's official designation is 2003UB313. Its discoverers, led by Dr. Michael Brown, have nicknamed it "Xena." The actual discovery and confirmation of the object were made by mining

images taken by sensitive electronic imagers mounted on a telescope, called CCDs (charge-coupled devices).

According to Louis Berman of the St. Louis Astronomical Society, Brown confirmed to the group of amateur astronomers before their attempt that, to his knowledge, they were the only people in the world attempting to see "Xena" through the eyepiece of a telescope. In terms of brightness, "Xena" is what astronomers would call a 19th magnitude object. That means that it's about five million times dimmer than Polaris, the North Star, which is sometimes difficult to see with the unaided eye. "Xena" is just at the limit of what can be seen with the human eye through the Struve Telescope.

The sighting took place on October 9, 2005, at 1:08 a.m. CDT. The first sighting was made by Keith Murdock of the St. Louis Astronomical Society. Confirmation occurred at 1:15 a.m. when Louis Berman, also of the St. Louis group, located the object. Eight more members of the group saw "Xena," in addition to two McDonald Observatory staffers, Kevin Mace and Frank Cianciolo. The observers followed a strict protocol and kept detailed records to verify their observations.

McDonald Observatory's Frank Cianciolo recalls the event: "*Since UB313 would not be high enough to observe until roughly 1:30 a.m. or so, the group planned to observe a number of other object prior to the 'Xena' attempt. The views of these other objects indicated that while we had reasonable conditions, we didn't have the excellent conditions the group had thought we may need to acquire UB313, so there was a bit of tension as the viewing window approached. "At the proper time, the guys from St. Louis worked with Kevin Mace to get the telescope pointed to the coordinates where they had calculated UB313 should be at that precise time. Fortunately, there were no bright stars in the field of view that would cause glare and possibly ruin any chance of seeing the object. Due to some confusion about sky orientation in the eyepiece, Keith Murdock spent several long minutes not recognizing the field he expected to see. Once that confusion was cleared up and a small correction to the telescope's point were made, however, it didn't take long for Keith to announce that he believed he could identify, conclusively, UB313. After Keith's sighting, it took each observer several minutes to properly understand the orientation of the field and then to hop from brighter stars to fainter stars and finally to see 'Xena.' At the staggering distance of roughly 90 AU [that is, 90 times the Earth-Sun distance], an object the size of UB313 essentially displays no measurable size. Due to this, it was no easy task to actually identify the incredibly faint fuzzy dot as anything but a star at the very limit of visibility through the 82-inch Struve Telescope*."

The object, Berman says, "*was a very dim, pointlike source that could only be seen through averted vision. If you looked straight at it, you'd never see it*." McDonald Observatory's Mace agrees. "*It looked like a faint star*," he said. "*A little difficult to pick out against the field stars - It's not visually stunning*." However, Mace continued, "*…how many people on the planet have seen this? Pretty much just our group*."

Cianciolo credits the sighting with the group's early preparations. "*Had it not been for the excellent charts and CCD images which the St. Louis group spent weeks preparing, there would have been no way to conclusively identify UB313*," Cianciolo said. "*It is a testament to the incredible skill and dedication some amateurs show to their passion of astronomy that the folks on the dome floor that night are, to anyone's knowledge, the only humans on the planet to have seen UB313 at an eyepiece. "Truly this has to go down as 'extreme astronomy,'*" he said.

These days, it is unusual for large telescopes at professional observatories to even have eyepieces. The astronomers at McDonald don't use the eyepieces for their observations - images are recorded onto computers. But the eyepiece capability makes three of McDonald's research-grade telescopes accessible to the public a few nights each month. The Struve, as well as the 2.7-meter (107-inch) Harlan J. Smith Telescope, may be the largest telescopes in the world available for public observing sessions. McDonald's smaller 0.9-meter (36-inch) telescope is also used for special public viewing programs.

ASTRONOMER ANNOUNCES SHORTLIST OF STELLAR CANDIDATES FOR HABITABLE WORLDS

In the search for life on other worlds, scientists can listen for radio transmissions from stellar neighborhoods where intelligent civilizations might lurk or they can try to actually spot planets like our own in habitable zones around nearby stars. Either approach is tricky and relies on choosing the right targets for scrutiny out of the many thousands of nearby stars in our galactic neighborhood.

Margaret Turnbull has devoted herself to the painstaking search for candidate stars that may harbor zones of habitability where life -- primitive or otherwise -- might thrive. Turnbull announced her shortlist of so-called "habstars" at the 2006 Meeting of the American Association for the Advancement of Science. Out of an initial catalogue of 17,129 "habitable stellar systems" that Turnbull and her colleagues published in 2003, she selected a handful of stars that she considers her best bets, based on a variety of screening criteria. Turnbull offered five top candidate stars for those seeking only to listen for radio signals from intelligent civilizations -- the Search for Extraterrestrial Intelligence or SETI -- and five candidates for those who undertake the demanding job of trying to detect Earth-like planets in orbit around nearby stars.

Astronomers have found evidence during the past decade for dozens of planets around nearby stars by studying how an object's gravity affects the orbit of the parent star. Virtually all of the discovered planets are gas giants like Jupiter and are presumed to be inhospitable to life. There have been hints of smaller, rocky planets like Earth, but definitive detection of such terrestrial planets likely awaits the deployment of more capable space-based observatories in about a decade. "*It's impossible to know the true nature of those planets until we can directly image them*," Turnbull said.

NASA had a mission on the drawing board called the Terrestrial Planet Finder, which would consist of two complementary space observatories. The first, a visible-light coronagraph, had been scheduled for launch around 2016, but the project has been deferred indefinitely, according to NASA's 2007 budget plan. A precursor planet-finder, called SIM PlanetQuest, has been delayed until at least 2015.

Turnbull made her habstar choices "*purely on the characteristics of the stars themselves*," she said in an interview. "*Stars are not all the same, and not all of them are like the Sun*." Her criteria included several related to age. The star has to be at least 3 billion years old, long enough for companion planets to form and complex life to develop. Variable stars that are prone to lots of flares and pyrotechnics tend to be too young to meet her criteria. Also, stars more than 1.5 times the mass of our Sun don't tend to live long enough to produce habitable zones.

Turnbull also considered the star's "metallicity." Stars and planets form out of the same parental cloud of dust and gas. If the star doesn't have enough iron in its atmosphere, it is likely the parent material did not contain enough heavy metals for planets to form.

Turnbull's candidate stars had to have at least 50 per cent of the iron content of the Sun. Stars with higher metal content also tend to reside in more peaceful orbits in the plane of the galaxy, Turnbull said. She also stars that, like our Sun, that reside on the "main sequence" of stellar evolution. No red giants or white dwarfs allowed. While her criteria are clearly Sun-centric, Turnbull said they make sense. "*We are intentionally biased toward stars that are like the Sun*," she said. Like the Sun, such stars tend to be toward the brighter range in luminosity and are more likely to live long enough for life-supporting planets to form. "*These are places I'd want to live if God were to put our planet around another star*," Turnbull said.

The search for signals from extraterrestrial civilizations will benefit from a new network of radio antennas, called the Allen Telescope Array, now under development. Forty two of the planned 350 telescopes in the array should be operational this year. Turnbull's top candidate star for such radio scans is beta CVn, a sun-like star about 26 light-years away in the constellation Canes Venatici (the Hound Dogs). (One light-year is about 5.9 trillion miles). Astronomers have been using currently available technology to search the star for accompanying planets but none has been found so far, Turnbull said. Her other top candidates for a SETI search:

* HD 10307, another solar analogue about 42 light-years away. It has almost the same mass, temperature and metallicity of the Sun. It also has a benign companion star.

* HD 211415, about half the metal content of Sun and a bit cooler, this star is in just a little farther away than HD 10307.

* 18 Sco, a popular target for proposed planet searches. The star, in the constellation Scorpio, is almost an identical twin to the Sun.

* 51 Pegasus. Already famous. In 1995, Swiss astronomers reported they had detected the first planet beyond our solar system in orbit around 51 Pegasus. An American team soon verified the finding of the Jupiter-like object and the rush to find more extra-solar planets was on. Turnbull thinks 51 Pegasus could harbor terrestrial planets as well.

Efforts to take direct images of Earth-like planets -- the goal of the planned Terrestrial Planet Finder (TPF) mission -- are extremely challenging. Astronomers want to find Earth-like planets orbiting close enough to the star -- but not too close -- for there to be an environment capable of having liquid water, a key ingredient of life. But such planets in orbits relatively close to the star simply get lost in the glare of the host star.

In choosing candidate stars for a TPF mission, Turnbull went for stars with enough intrinsic luminosity to suggest good prospects for a habitable zone but not so bright as to overwhelm efforts to images their planets. In her Goldilocks solution, the best candidates were K-class stars, objects that are intrinsically dimmer than the Sun. Turnbull's top choice is epsilon Indi A, a star only about one-tenth as bright as the Sun. It is nearby, about 11.8 light-years away in the constellation Indus. The star is among the top 100 targets for a TPF mission.

Her other TPF candidates:

* Epsilon Eridani. A star somewhat smaller and cooler than our Sun, located about 10.5 light-years away in the constellation Eridanus (the River).

* Omicron2 Eridani. A yellow-orange star about 16 light-years away, roughly the same age as the Sun.

* Alpha Centauri B. Part of the closest stellar system to the Sun, just 4.35 light-years away. Long considered one of the places in the Milky Way that might offer terrestrial conditions. This star is part of a triple star system.

* Tau Ceti. Unlike the candidates in this group, Tau Ceti is a G-class star, the same brightness category as our Sun. Metal-poor compared to the Sun but long-lived enough for complex life forms to evolve.

Turnbull acknowledges that it is a toss-up when it comes to naming just a few candidate habstars. "*There are inevitable uncertainties in how we understand these stars*," Turnbull said. "*If I took the top 100, it would be very difficult for me to tell which one is the best*." But the exercise is worthwhile, she said, and her selection criteria really did drive her toward a couple top choices and a handful of other candidates.

KaBoom! Ancient Impacts Scarred Moon to its Core, May Have Created "Man in the Moon"

Planetary scientists have found the remains of ancient lunar impacts that may have helped create the surface feature commonly called the "man in the moon." Their study suggests that a large object hit the far side of the moon and sent a shock wave through the moon's core and all the way to the Earth-facing side. The crust recoiled -- and the moon bears the scars from that encounter even today.

The finding holds implications for lunar prospecting, and may solve a mystery about how past impacts on Earth affect it's geology today.

The early Apollo missions revealed that the moon isn't perfectly spherical. Its surface is warped in two spots; an earth-facing bulge on the near side is complemented by a large depression on the Moon's far side. Scientists have long wondered whether these surface features were caused by Earth's gravity tugging on the moon early in its existence, when its surface was still molten and malleable.

According to Laramie Potts and Ralph von Frese, these features are instead remnants from ancient impacts. Potts and von Frese came to this conclusion after they used gravity fluctuations measured by Clementine and Lunar Prospector satellites to map the moon's interior. They expected to see defects beneath the moon's crust that corresponded to craters on the surface. Old impacts, they thought, would have left marks only down to the mantle, the thick rocky layer between the moon's metallic core and its thin outer crust. And that's exactly what they saw, at first. Potts pointed to a cross-sectional image of the moon that the scientists created using the Clementine data. On the far side of the moon, the crust looks as though it was depressed and then recoiled from a giant impact, he said. Beneath the depression, the mantle dips down as he and von Frese would expect it to do if it had absorbed a shock. Evidence of the ancient catastrophe should have ended there. But some 700 miles directly below the point of impact, a piece of the mantle still juts into the moon's core today.

That was surprising enough. "*People don't think of impacts as things that reach all the way to the planet's core*," von Frese said. But what they saw from the core all the way to the surface on the near side of the moon was even more surprising. The core bulges, as if core material was pushed in on the far side and pulled out into the mantle on the near side. Above that, an outward-facing bulge in the mantle, and above that -- on the Earth-facing side of the moon -- sits a bulge on the surface.

To the scientists, the way these features line up suggests that a large object such as an asteroid hit the far side of the moon and sent a shock wave through the core that emerged on the near side. The scientists believe that a similar, but earlier impact occurred on the near side. Potts and von Frese suspect that these events happened about four billion years ago, during a period when the moon was geologically active -- with its core and mantle still molten and magma flowing.

Back then, the moon was much closer to the Earth than it is today, Potts explained, so the gravitational interactions between the two were stronger. When magma was freed from the Moon's deep interior by the impacts, Earth's gravity took hold of it and wouldn't let go. So the warped surfaces on the near and far sides of the moon and the interior features that connect them are all essentially signs of injuries that never healed. "*This research shows that even after the collisions happened, the Earth had a profound effect on the moon*," Potts said.

The impacts may have created conditions that led to a prominent lunar feature. The "man in the moon" is a collection of dark plains on the Earth-facing side of the moon, where magma from the moon's mantle once flowed out onto the surface and flooded lunar craters. The moon has long since cooled, von Frese explained, but the dark plains are a remnant of that early active time -- "a frozen magma ocean."

How that magma made it to the surface is a mystery, but if he and Potts are right, giant impacts could have created a geologic "hot spot" on the moon -- a site where magma bubbles to the surface. Some time between when the impacts occurred and when the moon solidified, some magma escaped the mantle through cracks in the crust and flooded the nearside surface and formed a lunar "hot spot". A hot spot on Earth forms the volcanoes that make the Hawaiian island chain. The Ohio State scientists wondered: could similar ancient impacts have penetrated the Earth, and caused the hot spots that exist here today? von Frese thinks that it's possible.

"*Surely Earth was peppered with impacts, too*," he said. "*Evidence of impacts here is obscured, but there are hot spots like Hawaii. Some hot spots have corresponding hot spots on the opposite side of the Earth. That could be a consequence of this effect*." He and Potts are exploring the idea, by studying gravitational anomalies under the Chicxulub Crater on Mexico's Yucatan Peninsula . A giant asteroid struck the spot some 65 million years ago, and is believed to have set off an environmental chain reaction that killed the dinosaurs.

The space agency has been charged with returning astronauts to the moon to prospect for valuable gases and minerals. But even today, scientists don't entirely know what the moon is made of -- not down to the core, anyway. They can calculate where certain minerals should be, given the conditions they believe existed when the moon formed. But impacts like the one Potts and von Frese discovered have since shuffled materials around. Gravity measurements, they said, will play a key role as scientists figure out what materials lie within the moon, and where.

"*We don't fully understand the way these minerals settle out under temperature and pressure, so the exact composition of the moon is difficult to determine. We have to use gravity measurements to calculate the density of materials, and then use that information to extrapolate the likely composition*," Potts said.

von Frese said a lunar base would be needed before scientists can more completely answer these questions. Potts agreed. "*Once we have more rock samples and soil samples, we will have a lot more to go on. Nothing is better than having a person on the ground*," he said.

http://researchnews.osu.edu/archive/moonboompix.htm

'Deep Impact' Reports First Evidence of Cometary Ice

Comet Tempel 1, target of last year's July 4 cosmic collision, contains small amounts of surface water ice. Reported by members of NASA's Deep Impact mission, this finding marks the first evidence of surface ice on any comet.

Comet Tempel 1, which created a flamboyant Fourth of July fireworks display in space last year, is covered with a small amount of water ice. These results, reported by members of NASA's Deep Impact team in an advanced online edition of Science, offer the first definitive evidence of surface ice on any comet. "*We have known for a long time that water ice exists in comets, but this is the first evidence of water ice on comets*," said Jessica Sunshine, Deep Impact co-investigator and lead author of the Science article.

The chief scientist, Sunshine, said the discovery offers important insight into the composition of comets -- small, Sun-orbiting space travelers that are believed to be leftovers from the formation of the solar system. "*Understanding a comet's water cycle and supply is critical to understanding these bodies as a system and as a possible source that delivered water to Earth*," she said. "*Add the large organic component in comets and you have two of the key ingredients for life*."

The findings help satisfy one of the major goals of the Deep Impact mission: Find out what is on the inside -- and outside -- of a comet. To that end, JPL teamed with the University of Maryland to slam a space probe into Tempel 1, then analyze materials from the comet's surface and interior. On July 4, 2005, mission members hit their mark when the copper-tipped probe collided with Tempel 1 and created a spectacular extraterrestrial explosion 83 million miles from Earth. Since then, the Deep Impact team has reported a few key findings. These include an abundance of organic matter in Tempel 1's interior as well as its likely origins -- the region of the solar system now occupied by Uranus and Neptune.

According to the new research, the comet's surface features three pockets of thin ice. The area the ice covers is small. The surface area of Tempel 1 is roughly 45 square miles or 1.2 billion square feet. The ice, however, covers roughly 300,000 square feet. And only 6 percent of that area consists of pure water ice. The rest is dust. "*It's like a seven-acre skating rink of snowy dirt*," said Peter Schultz, Deep Impact co-investigator and co-author on the paper. Sunshine, Schultz and the rest of the team arrived at their findings by analyzing data captured by an infrared spectrometer, an optical instrument that uses light to determine the composition of matter. Based on this spectral data, it appears that the surface ice used to be inside Tempel 1 but became exposed over time. The team reports that jets -- occasional blasts of dust and vapor -- may send this surface ice, as well as interior ice, to the coma, or tail, of Tempel 1. "*So we know we're looking at a geologically active body whose surface is changing over time*," Schultz said. "*Now we can begin to understand how and why these jets erupt*."

Scientists Solve Mystery of Methane in Titan's Atmosphere

An international team of planetary scientists may have solved the mystery of why the atmosphere of Saturn's moon, Titan, is rich in methane. Methane, which on Titan plays a role similar to water on Earth, is locked in a methane-rich water ice that forms a crust

above an ocean of liquid water mixed with ammonia, the scientists say. Major episodes of outgassing pumped methane into Titan's mostly nitrogen atmosphere three times during the moon's evolutionary history, they discovered.

Gabriel Tobie, Jonathan Lunine, and Christophe Sotin, describe their model of how Titan's atmosphere evolved in the March 2 issue of Nature. Results from the European Space Agency's Huygens probe that landed on Titan Jan. 14, 2005, and remote sensing instruments on the Cassini orbiter agree with their findings, they add. The presence of methane in Titan's atmosphere is one of the major enigmas that the Cassini-Huygens mission to Saturn's system is trying to resolve, the scientists noted. Scientists have long known that Titan's atmosphere contains methane, ethane, acetylene and many other hydrocarbon compounds. But sunlight irreversibly destroys methane after tens of millions of years, so something has replenished methane in Titan's thick air during the moon's 4.5 billion-year history.

The first episode of methane gas release happened after Titan formed its dense rock core and water mantle beneath an ice crust, said planetary sciences Professor Jonathan Lunine, an interdisciplinary scientist for the Huygens probe.

Ammonia acting as an antifreeze, heat leftover from formation, and heat from radioactive elements aided the release of methane during the first billion years, or possibly just a few hundred million years, in Titan's history.

Much of the methane in this first release might have been reabsorbed into Titan's interior. But whatever methane was left in the atmosphere was photochemically destroyed in the first billion years, Lunine said. The second methane-release episode around two billion years ago is even more interesting, Lunine said. That's when convection began within Titan's silicate core. "*The core, made of rock, continued to heat up because it contains natural radioactive elements like uranium, potassium and thorium. On Earth, these elements are concentrated in the crust, but on Titan, they'd be deep down in the rock. So the core gets hotter and hotter, until finally it's soft enough for convection to start*."

Convection is the mechanical turnover of material to remove heat. The second event of around two billion years ago injected a burst of convection heat into Titan's overlying mantle, causing the ice crust to thin and methane to outgas through ice to the surface. The latest methane-release episode began around 500 million years ago. It's the result of the planet cooling by convection in Titan's solid ice crust. While the cause for each outgassing episode differs, the result is the same, Lunine said: "*There's an injection of methane into the surface and atmosphere of Titan. We are now in an era where there's enough outgassing to add methane to the atmosphere, but not enough for widespread seas of methane*." This outgassing episode will be Titan's last. "*There'll be no further such events until billions of years in the future, when the sun goes red giant and cooks Titan*," Lunine said. "*Methane outgassing will cease within the next few hundred million years. Then photochemistry will destroy the surface methane and Titan will indeed dry up. The atmosphere will clear of haze, and Titan will look very different*." When the Huygens probe warmed Titan's damp surface where it landed in January 2005, its instruments inhaled whiffs of methane. The heat of the probe caused methane trapped in pores just below the surface to evaporate, just as subsurface water would evaporate on Earth if you fired up a camping stove in the sand of a dry streambed.

MOST MILKY WAY STARS ARE SINGLE

Common wisdom among astronomers holds that most star systems in the Milky Way are multiple, consisting of two or more stars in orbit around each other. Common wisdom is wrong. A new study by Charles Lada demonstrates that most star systems are made up of single stars. Since planets probably are easier to form around single stars, planets also may be more common than previously suspected.

Astronomers have long known that massive, bright stars, including stars like the sun, are most often found to be in multiple star systems. This fact led to the notion that most stars in the universe are multiples. However, more recent studies targeted at low-mass stars have found that these fainter objects rarely occur in multiple systems. Astronomers have known for some time that such low-mass stars, also known as red dwarfs or M stars, are considerably more abundant in space than high-mass stars.

By combining these two facts, Lada came to the realization that most star systems in the Galaxy are composed of solitary red dwarfs. "*By assembling these pieces of the puzzle, the picture that emerged was the complete opposite of what most astronomers have believed*," said Lada. Among very massive stars, known as O- and B-type stars, 80 percent of the systems are thought to be multiple, but these very bright stars are exceedingly rare. Slightly more than half of all the fainter, sun-like stars are multiples. However, only about 25 percent of red dwarf stars have companions. Combined with the fact that about 85 percent of all stars

that exist in the Milky Way are red dwarfs, the inescapable conclusion is that upwards of two-thirds of all star systems in the Galaxy consist of single, red dwarf stars. The high frequency of lone stars suggests that most stars are single from the moment of their birth. If supported by further investigation, this finding may increase the overall applicability of theories that explain the formation of single, sun-like stars. Correspondingly, other star-formation theories that call for most or all stars to begin their lives in multiple-star systems may be less relevant than previously thought.

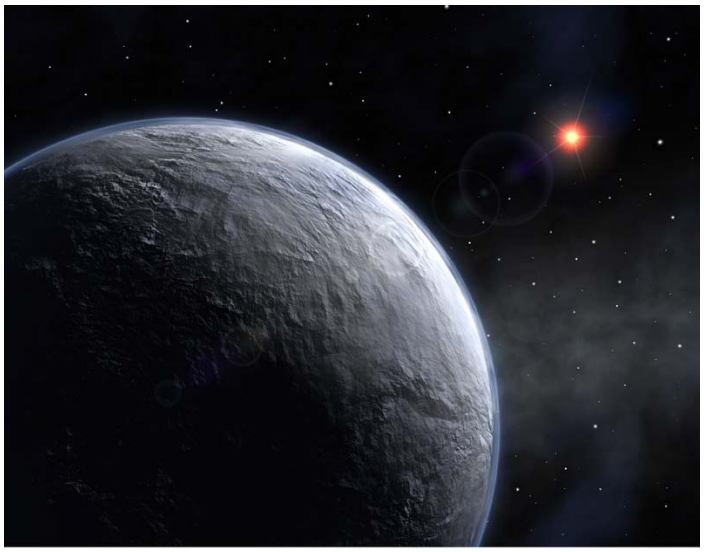
"*It's certainly possible for binary star systems to 'dissolve' into two single stars through stellar encounters*," said astronomer Frank Shu who was not involved with this discovery. "*However, suggesting that mechanism as the dominant method of single-star formation is unlikely to explain Lada's results*."

Lada's finding implies that planets also may be more abundant than astronomers realized. Planet formation is difficult in binary star systems where gravitational forces disrupt protoplanetary disks. Although a few planets have been found in binaries, they must orbit far from a close binary pair, or hug one member of a wide binary system, in order to survive. Disks around single stars avoid gravitational disruption and therefore are more likely to form planets.

Interestingly, astronomers recently announced the discovery of a rocky planet only five times more massive than Earth. This is the closest to an Earth-size world yet found, and it is in orbit around a single red dwarf star. "*This new planet may just be the tip of the iceberg*," said Lada. "*Red dwarfs may be a fertile new hunting ground for finding planets, including ones similar in mass to the earth*." "*There could be many planets around red dwarf stars*," stated astronomer Dimitar Sasselov. "*It's all in the numbers, and single red dwarfs clearly exist in great numbers."*

"*This discovery is particularly exciting because the habitable zone for these stars -- the region where a planet would be the right temperature for liquid water -- is close to the star. Planets that are close to their stars are easier to find. The first truly Earth-like*

planet we discover might be a world orbiting a red dwarf," added Sasselov. http://www.cfa.harvard.edu/press/pr0611image.html



Five Earth Masses Icy Extrasolar Planet
(Artist's Impression)

ESO PR Photo 03a/06 (January 25, 2006) © ESO

PLUTO'S NEW MOONS LIKELY BORN WITH CHARON; PLUTO MAY EVEN HAVE RINGS

A team of scientists led by Dr. S. Alan Stern concludes that two newly discovered small moons of Pluto were very likely born in the same giant impact that gave birth to Pluto's much larger moon, Charon. The team also argues that other, large binary Kuiper Belt Objects (KBOs) may also frequently harbor small moons, and that the small moons orbiting Pluto may generate debris rings around Pluto. The team discovered Pluto's two small moons in 2005 using sensitive images obtained by the Hubble Space Telescope. "*The evidence for the small satellites being born in the Charon-forming collision is strong; it is based around the facts that the small moons are in circular orbits in the same orbital plane as Charon, and that they are also in, or very near, orbital resonance with Charon*," says lead author Stern. "*Tests of this scenario will come from refined orbital data, from measuring the rotational periods of these moons, and from determinations of their densities and surface compositions*," says co-author Weaver.

Collisions, both large and small, are major processes that shaped many aspects of our solar system. Scientists use computer simulations to study the origin of planetary systems formed by impact events of a scale much larger than could be simulated in a laboratory. Another large collision, like the one thought to have created Charon and Pluto's small moons, is believed responsible for the formation of the Earth-moon pair. "*The idea that Pluto's small moons and Charon resulted from a giant impact now seems compelling. Future simulations to determine the characteristics of the impact required to produce all three satellites should provide improved constraints on the early dynamical history of the Kuiper Belt*," adds Dr. Robin Canup, who in 2005 produced the most comprehensive models to date of the Charon-forming impact. Based on the growing realization that binary "ice dwarf" pairs like Pluto-Charon are common in the numerous triple, quadruple and Kuiper Belt, the Pluto satellite discovery team concludes that

even higher-order systems may be discovered across the Kuiper Belt in years to come. "*Finding small satellites around KBOs is difficult because their large distance from the Sun makes them appear very faint. As a result, we don't really know how common it is for KBOs to have multiple satellites*," adds co-author Steffl. "*One good way to test this is to search around objects that have been ejected from the Kuiper Belt into orbits that bring them much closer to the Sun. So far, about 160 of these objects, called Centaurs, have been discovered. We hope to use Hubble to search for faint moons around some of them*." Co-author Merline adds, "*If Pluto's small moons generate debris rings from impacts on their surfaces, as we predict, it would open up a whole new class of study because it would constitute the first ring system seen around a solid body rather than a gas giant planet*." "*The Pluto system never fails to reward us when we look at it in new ways*," concludes Stern. "*What a bonanza and an illustration of the richness of nature Pluto has consistently proved to be. Our discovery of its two new moons reinforces that lesson yet again*." http://www.swri.org/press/2006/plutoimpact.htm

BINARY ASTEROID IN JUPITER'S ORBIT MAY BE ICY COMET FROM SOLAR SYSTEM'S INFANCY

A bound pair of icy comets similar to the dirty snowballs circling outside the orbit of Neptune has been found lurking in the shadow of Jupiter. Astronomers at the Keck Telescope in Hawaii, have calculated the density of a known binary asteroid system that shares Jupiter's orbit, and concluded that Patroclus and its companion probably are composed mostly of water ice covered by a patina of dirt. Because dirty snowballs are thought to have formed in the outer reaches of the solar system, from which they are occasionally dislodged and end up looping closer to the sun as comets, the team suggests that the asteroid probably formed far from the sun. It most likely was captured in one of Jupiter's Trojan points -- two eddies where debris collects in Jupiter's orbit -- during a period when the inner solar system was intensely bombarded by comets, around 650 million years after the formation of the solar system. If confirmed, this could mean that many or most of the probably thousands of Jupiter's Trojan asteroids are dirty snowballs that originated much farther from the sun and at the same time as the objects now occupying the Kuiper Belt. "*It's our suspicion that the Trojans are small Kuiper*

Belt objects," said study leader Franck Marchis, a research astronomer. The team's conclusion adds support to a recent hypothesis about the evolution of the orbits of our solar system's largest planets, Jupiter, Saturn, Uranus and Neptune, put forth by a group of researchers headed by Alessandro Morbidelli, a theoretical astronomer. In a Nature paper last year, Morbidelli and colleagues proposed that icy comets would have been captured in Jupiter's Trojan points during the early history of the solar system. According to their scenario, during the first few hundred million years after the birth of the solar system, the large gas planets orbited closer to the sun, enveloped in a cloud of billions of large asteroids called planetesimals, perhaps 100 kilometers (62 miles) in diameter or less. Interactions with these planetesimals caused the large gaseous planets to migrate outward until about 3.9 billion years ago, when Jupiter and Saturn entered resonant orbits and began tossing the planetesimals around like confetti, some of them leaving the solar system for good. The bulk of the remaining planetesimals settled into orbits beyond Neptune -- today's Kuiper Belt and the source of short-period comets -- but a small number were captured in the Trojan eddies of the giant planets, in particular Jupiter. "*This is the first time anyone has determined directly the density of a Trojan asteroid, and it supports the new scenario proposed by Morbidelli*," said coauthor Daniel Hestroffer. "*These asteroids would have been captured in the Trojan points at a time when the rocky planets were still forming, and this perturbation of the planetesimals about 650 million years after the birth of the solar system could have created the late bombardment of the Moon and Mars*." Though Marchis refers to the scenario as "*a nice story*," he admits that more work needs to be done to provide support for it. "*We need to discover more binary Trojans and observe them to see if low density is a characteristic of all Trojans*," he said. Trojan asteroids are those caught in the so-called Lagrange points of Jupiter's orbit, located the same distance from Jupiter as Jupiter is from the sun -- 5 astronomical units, or 465 million miles. These points, one leading and the other trailing Jupiter, are places were the gravitational attraction of the sun and Jupiter are balanced, allowing debris to collect like dust bunnies in the corner of a room. Hundreds of asteroids have been discovered in the leading (L4) and trailing (L5) points, each orbiting around that point as if in an eddy.

The asteroid 617 Patroclus, originally discovered at L5 and named in 1906, was found to have a companion in 2001, and so far is the only known Trojan binary. The discoverers were not able to estimate the orbit of the components because they had too few observations. As experienced asteroid hunters, Marchis and his colleagues in August this year discovered the first triple asteroid system, 87 Sylvia, much closer to the Sun in the main asteroid belt between Mars and Jupiter, and used a powerful 8-meter telescope of the European Southern Observatory's Very Large Telescope in Chile to study the three objects. They were able to chart the orbits of the asteroids to estimate the density of Sylvia, from which they concluded it is a rubble-pile of loosely, packed rock. The team tried the same technique with the much more distant Patroclus, employing imaging data from the Keck II Laser Guide Star System at the W. M. Keck Observatory on Mauna Kea, which yields a sharp resolution impossible with any other ground-based telescope.

"*Before, we could only look at objects near a bright reference star, limiting the use of adaptive optics to a small percentage of the heavens*," Marchis said. "*Now, we can use adaptive optics to view almost any point on the sky*." The laser guide star system uses a laser beam to excite sodium atoms within a small spot in the upper atmosphere. This artificial "star" is used to measure atmospheric turbulence, which is then removed by the movable mirrors of the Keck adaptive optics system. With the system providing an unparalleled 58 milli-arcsecond resolution, the Keck team made five observations in the infrared between November 2004 and July 2005. Marchis and his colleagues determined that the density of Patroclus and its companion, which are about the same size and circle around their center of mass every 4.3 days at a distance of 680 kilometers (423 miles), was very low: 0.8 grams per cubic centimeter, about one third that of rock and light enough to float in water. Assuming a rocky composition similar to that of Jupiter's moons Callisto and Ganymede, the components of the system would have to be very loosely packed -- about half empty space, an internal characteristic which is not expected for a same-size binary system, the researchers concluded. The team suggests a more reasonable composition of water ice with only 15 percent open space, which makes these objects similar to comets and small Kuiper Belt objects, which have been determined to have densities less than water.

Marchis suspects that the binary system formed when a single large asteroid was torn asunder by the gravitational tug of Jupiter. "*The Patroclus system displays similar characteristics to the binary Near-Earth Asteroids, which are believed to have formed during an encounter with a terrestrial planet by tidal splitting*," he said. "*In the case of a Trojan asteroid, it is only when the work of our collaborators was published recently that we could suggest that this encounter was with Jupiter*."

Because in Homer's Iliad, Patroclus was Achilles' companion and a hero of the Trojan War, Achilles would have been an appropriate name for one of the two asteroids, which are about the same size. However, another asteroid already has the name Achilles, so Marchis and his collaborators proposed naming the smallest member of the binary system Menoetius, after the father of Patroclus. The Committee on Small Body Names of the IAU has tentatively accepted the name. The asteroid designated Menoetius is about 112 kilometers (70 miles) in diameter, while Patroclus is about 122 kilometers (76 miles) wide. . http://www.berkeley.edu/news/media/download/2006/02/patroclus.jpg

SWIFT GAMMA RAY SATELLITE DETECTS UNUSUAL COSMIC EXPLOSION – FIRST STAGE OF A SUPERNOVA?

The Swift satellite, whose mission operations control center is at Penn State, in State College Pennsylvania, has detected a cosmic explosion that has sent scientists around the world scrambling to telescopes to document this startling event. Gamma-ray radiation from the source, detected on 18 February and lasting about half an hour, appears to be a precursor to a supernova, which is the death throes of a star much more massive than the Sun. "*The observations indicate that this is an incredibly rare glimpse of an initial gamma-ray burst at the beginning of a supernova*," said Peter Brown, a member of the Swift science team. Astronomers are using Swift to continue to observe the event. Scores of satellites and ground-based telescopes also are now trained on the sight, watching and waiting. Amateur astronomers in the northern hemisphere with a good telescope in dark skies also can view the source.

The explosion has the trappings of a gamma-ray burst, the most distant and powerful type of explosion known. This event, however, was about 25 times closer and 100 times longer than the typical gamma-ray burst. "*This burst is totally new and unexpected*," said Neil Gehrels, Swift principal investigator. "*This is the type of unscripted event in our nearby universe that we hoped Swift could catch*." The explosion, called GRB 060218 after the date it was discovered, originated in a star-forming galaxy about 440 million light-years away toward the constellation Aries.

This is the second-closest gamma-ray burst ever detected, if indeed it is a true burst.

Derek Fox, assistant professor of astronomy and astrophysics, who is leading the monitoring effort of GRB 060218 on the Hobby-EberlyTelescope, commented, "*This is the burst we've been waiting eight years for*," referring to the closest-ever gamma-ray burst, which was detected in 1998. "*The special capabilities of Swift, which was not operating in 1998, combined with the intense campaign of ground-based telescopes, should help unravel this mystery,"* said Fox. "*There are still many unknowns*," said John Nousek, the Swift mission operations director. The burst of gamma rays lasted for nearly 2,000 seconds; in contrast, most such bursts last a few milliseconds to tens of seconds. The explosion also was surprisingly dim. "*This could be a new kind of burst, or we might be seeing a gamma-ray burst from an entirely different angle*," he said. The standard theory for gamma-ray bursts is that the high-energy light is beamed in our direction. "*This off-angle glance -- a profile view, perhaps -- has given us an entirely new approach to studying star explosions. Had this burst been farther away, we would have missed it*," Nousek explained. Because the burst was so long, Swift was able to observe the bulk of the explosion with all three of its instruments: the Burst Alert Telescope, which detected the burst; and the X-ray Telescope, and Ultraviolet/Optical Telescope, which provide high-resolution imagery and spectra across a broad range of wavelengths. Penn State lead the development of the X-ray and Ultraviolet/Optical Telescopes. Scientists will attempt observations with the Hubble Space Telescope and the Chandra X-ray Observatory. Amateur astronomers in dark skies might be able to see the explosion with a 16-inch telescope as it hits 16th-magnitude brightness.

THE WORLD'S METEORITES ARE VANISHING

If something isn't done soon, most of Earth's rare space rocks could be gone in a lifetime. This particularly alarms scientists who want to study meteorites -- rocks from outer space ranging in size from microscopic particles to boulders weighing tons -- because the extraterrestrial rocks can help them unlock the secrets of our solar system's history and, possibly, the origins of life. Part of the problem is that meteorites are being collected at a record pace. Specimens that have fallen over millions of years are being harvested in places like Africa's Sahara Desert in a few decades. Commercial dealers are buying these space rocks at prices the scientific community can't match and cutting them into small pieces for sale to bidders in a flooded market.

But it doesn't have to end this way, say a meteorite collector and a university scientist. They are organizing a new center to save the irreplaceable solar system treasure for future generations. "*The whole point of what we're doing is to prevent people from cutting every rare meteorite into tiny, little pieces*," said Marvin Killgore, one of the world's foremost private collectors of meteorites. Killgore and Dante Lauretta, of The University of Arizona Lunar and Planetary Laboratory (LPL), have founded the UA Southwest Meteorite Center (SWMC), which will preserve the space rocks through an alternative marketing strategy designed to benefit meteorite collectors dealers and enthusiasts, while preserving the resource for scientists who need meteorites for research and educational activities. SWMC will offer collectors, dealers, owners and amateur enthusiasts a fair price for part of the vanishing meteorite legacy. In some cases, this will allow collectors who've spent their lives cherishing meteorites to preserve their collections after they die. Their heirs can sell collections to SWMC at a fair price, and the collections will be preserved in their names. SWMC will curate meteorites to the highest standards, Lauretta said. Staff will document each meteorite, adding the information to a comprehensive database that will be available to the public. "*By taking the characteristics of each meteorite and putting it into the database, we will be able to tell the dealer or finder that the UA center will pay this much per gram of the specimen*," Killgore said. "*And after UA buys some, or all, of the meteorite for the public repository, everybody in the market will know just how much of the material is still left for sale."* That benefits the seller because it's easier to get top dollar for the rest of the meteorite when people know exactly what it is and how much of it is still on the market, Killgore explained. "*What this center basically does is control the market situation and at the same time puts away some of the meteorite for future generations*." Until now, there has been no organization that could rapidly and accurately classify meteorites for collectors. In the past, meteorite enthusiasts have waited months or years for their samples to be scientifically analyzed because researchers have been overloaded with too many meteorites to identify and classify. As a result, many frustrated collectors and dealers have sidestepped the scientific community when naming and distributing their specimens.

Lauretta and Killgore, who was recently named curator of meteorites at LPL, say the goal is to develop SWMC as a world-class meteorite repository that will house one of the world's largest collections for research and public education. Anyone who collects or owns meteorites can bring them to the new non-profit center for identification, classification, and possible sale. Lauretta, SWMC director, and Killgore have started raising funds to acquire and preserve meteorites and are promoting the new center this week through the Tucson Gem and Mineral Show. This annual event draws meteorite enthusiasts and other gem and mineral collectors from around the world. Killgore, who has collected meteorites for the past 16 years, has loaned a significant part of his world-class collection to SWMC to jumpstart the center's efforts. His collection is valued at about $5 million, weighs 3,328 kilograms (about 7,340 pounds), and comes from about 900 locations in 37 countries.

LPL Director Michael Drake provided initial, first-year funding to pay salaries and provide physical space in LPL's Phoenix Mission Science Operation Center, 1415 N. Sixth Ave., Tucson. SWMC will become self-funding after a year, Drake said. Donations to SWMC are tax deductible and will fund an endowment for purchasing meteorite specimens; support meteorite classification, analysis and curation; fund student scholarships; and enable center staff to build a premier meteorite exhibit for research and public display. Those who donate $500 or more will receive a limited edition gift that includes a sample of pallasite -- one of the world's rarest, most sought-after type of meteorite -- suspended in acrylic. Pallasites account for only about one percent of all known meteorites. They are prized not just for the beauty of their gem-quality olivine, or peridot, captured in a nickel-iron matrix. The stony-iron meteorites are prized because they come from the core-mantle boundary of a disrupted minor planet in the ancient solar system.

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 before the 1st of the month of publication, for example, material for May's newsletter should be received May 1st. 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 February's Stargazer:

The next EAS Meeting is 3:00 P.M. SATURDAY, March 4th 2006 at the Everett Public Library Auditorium.