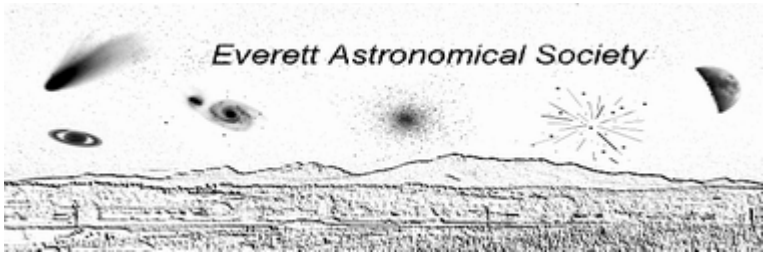
-

Volume MMVI. No. 8



The Stargazer

August 2006

President: Mark Folkerts	(425) 486-9733	folkerts at seanet.com	***The Stargazer***
VP & Librarian: Mike Locke	(425) 259-5995	mlocke at lionmts.com	**P.O. Box 12746**
Treasurer: Carol Gore	(360) 856-5135	janeway7C at aol.com	**Everett, WA 98206**
Newsletter co-editor: Bill O'Neil	(774) 253-0747	wonastrn at seanet.com	
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 - WEDNESDAY AUGUST 16TH AT 6:30 PM AT THE EVERETT PUBLIC LIBRARY, IN THE AUDITORIUM (DOWNSTAIRS)

THIS MONTH'S MEETING PROGRAM:
August 16th (Wednesday night) presentation will be **"Searching for Super Stars"** about a group of professional and an amateur astronomer searching for supernovae, colliding stars, and black holes - and trying to determine the age and expansion of the universe.

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:

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."

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 Mike Locke at (425) 259-5995 for info or check the EAS website.) Members contact Mike Locke for scope borrowing.

Other Western US Star Parties this season:

Aug 24-27 – Oregon Star Party (OSP) Ochocco NF
http://www.oregonstarparty.org/ Jul 28 reg deadline

Aug 19-Aug 27 - Mt. Kobau Star Party 2006
http://www.mksp.ca/ Mt. Kobau, BC

Aug 18-20 - Klickatat August 2006 Star Party
http://klickitatstarparty.net/ Goldendale WA

Aug 25-27 - Idaho Star Party
Bruneau Dunes State Park
http://www.boiseastro.org/

Sep 02 - RCA Autumnal Equinox Celebration - Rooster Rock State Park - located 22 miles east of Portland on I-84 (east of Sandy River) at exit 25, starting at 7:30 pm. Parking is $3 per vehicle. For possible weather cancellation, call (503) 797-4610 for latest info. http://www.omsi.edu/visit/planetarium/starparties.cfm

Sep 20-23 - The Enchanted Skies Star Party 2006
http://www.socorro-nm.com/starparty/ Socorro NM

Sep 22-24 - Klickatat September 2006 Star Party
http://klickitatstarparty.net/ Goldendale WA

Sep 22-24 - Craters Star Party -
Craters of the Moon National Monument, ID
http://www.boiseastro.org/

Sep 21-24 - Alberta Star Party 2006
http://calgary.rasc.ca/asp2006.htm

Sep 21-23 - California Star Party (CAS)
San Jose Astronomical Association 2
Lake San Antonio Park http://www.sjaa.net/

Oct 20-22 - Klickatat October 2006 Star Party
http://klickitatstarparty.net/ Goldendale WA

Oct 19-22 - Annual Nightfall (RTMC)
Riverside, CA

Nov 08 – RCA observing of the Mercury Transit
OMSI East Parking Lot, Portland OR
http://www.omsi.edu/visit/planetarium/starparties.cfm

$$ - Financial Health - $$

The club maintains a $650+ 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
8-inch Dobsonian	Free	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

August 2006

Aug 07 - Mercury at Greatest Western Elongation
Aug 10 - Mercury Passes 2.2 Degrees From Venus
Aug 10 - Neptune at Opposition
Aug 11 - Asteroid 1 Ceres Closest Approach To Earth (1.984 AU)
Aug 12 - Perseids Meteor Shower Peak
Aug 16 - Asteroid 1 Ceres At Opposition (7.6 Magnitude)
Aug 20 - Mercury Passes 0.5 Degrees From Saturn
Aug 24-27 – Oregon Star Party (OSP) Ochocco NF
Aug 25 - Northern Iota Aquarids Meteor Shower Peak
Aug 26 - Venus Passes 0.1 Degrees From Saturn

September 2006

Sep 05 - Uranus at Opposition
Sep 07 - Partial Lunar Eclipse
Sep 08 - 40th Anniversary (1966), 1st Star Trek Episode on TV
Sep 22 - Annular Solar Eclipse
Sep 23 - Autumnal Equinox (04:03 UT)
Sep 23 - Cassini, Titan Flyby

October 2006

Oct 09 - Draconids Meteor Shower Peak
Oct 17 - Mercury at Greatest Eastern Elongation (25 Degrees)
Oct 21 - Orionids Meteor Shower Peak
Oct 29 - Daylight Saving - Set Clock Back 1 Hour

November 2006

Nov 03 - Taurids Meteor Shower Peak
Nov 08 - Mercury Transits the Sun
Nov 13 - Asteroid 7 Iris At Opposition (6.8 Magnitude)
Nov 17 - Leonids Meteor Shower Peak

December 2006

Dec 13 - Geminids Meteor Shower Peak
Dec 22 - Winter Solstice, 00:22 UT
Dec 22 - Ursids Meteor Shower Peak

January 2007

Jan 03 - Earth At Perihelion (0.983 AU From Sun)
Jan 03 - Quadrantids Meteor Shower Peak
Jan 08 - Stephen Hawking's 65th Birthday (1942)

February 2007

Feb 07 - Mercury at Greatest Eastern Elongation
Feb 18 - Chinese New Year

March 2007

Mar 21 - Vernal Equinox, 00:07 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

Aug 16	Last Quarter Moon
Aug 23	New Moon
Aug 31	First Quarter Moon
Sep 07	Full Moon
Sep 14	Last Quarter Moon
Sep 22	New Moon
Sep 30	First Quarter Moon
Oct 07	Full Moon

Oct 14	Last Quarter Moon
Oct 22	New Moon
Oct 29	First Quarter Moon
Nov 05	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	**6:06 am**	**13:13**	**20:19**	**Leo**	**-27.5**
Mercury	**4:42 am**	Daylight	Daylight	**Can**	**-1.0**
Venus	**04:21 am**	Daylight	Daylight	**Can**	**-3.9**
Mars	Daylight	Daylight	**21:09**	**Leo**	**+1.8**
Jupiter	Daylight	Daylight	**23:02**	**Lib**	**-2.0**
Saturn	**05:24 am**	Daylight	Daylight	**Can**	**+0.4**
Uranus	**20:56**	**02:31 am**	Daylight	**Aqr**	**+5.8**
Neptune	Daylight	**0:54 am**	**5:46am**	**Cap**	**+7.8**
Pluto	Daylight	**21:03**	**1:57am**	**Ser**	**+13.9**

(times local time for Everett PDT)

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

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

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.

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

ASTRONOMICAL NOTES -- ON & OFF THE WEB…

SCIENTISTS GAINING CLEARER PICTURE OF COMET MAKEUP AND ORIGIN

Scientists are getting their best understanding yet of the makeup of comets - not only of the materials inside these planetary building blocks, but also of the way they could have formed around the Sun in the solar system's earliest years. When the Deep Impact spacecraft slammed into comet Tempel 1 on July 4, 2005, the collision sent tons of pristine materials into space and gave astronomers from around the world, using ground- and space-based telescopes, the first look "inside" a comet. From that sample, over the past several months, scientists who used the imaging spectrometer on Spitzer Space Telescope have refined their models of what a comet is made of and how it comes together. The Spitzer observation team was led by Dr. Carey Lisse. "*Spitzer's spectral observations of the impact at Tempel 1 not only gave us a much better understanding of a comet's makeup, but we now know more about the environment in the solar system at the time this comet was formed*," Lisse says.

From its orbit in space, Spitzer's infrared spectrograph closely observed the materials ejected from Tempel 1 when Deep Impact's probe dove into the comet's surface. Astronomers spotted the signatures of solid chemicals never seen before in comets, such as carbonates (chalk) and smectite (clay), metal sulfides (like fool's gold), and carbon-containing molecules called polycyclic aromatic hydrocarbons, found in barbecue grills or automobile exhaust on Earth. Lisse says the clay and carbonates were surprises because they typically require liquid water to make - and liquid water isn't found in the regions of deep space where comets form. Also surprising was the superabundance of crystalline silicates, material formed only at red-hot temperatures found inside the orbit of Mercury. "*In the same body, you have material formed in the inner solar system, where water can be liquid, and frozen material from out by Uranus and Neptune*," Lisse says. "*Except for the lightest elements, the total abundances of atoms in the comet are practically the same as makes up the Sun. It implies there was a great deal of churning in the primordial solar system, with high- and low-temperature materials mixing over great distances*." Planets, comets and asteroids were all born out of a thick and dusty mix of chemicals that surrounded the young Sun. Because comets formed in the outer, colder regions of our solar system, some of this early planetary material remains frozen inside them. By refining their list of comet ingredients, theoreticians can begin testing models of planet formation.

More than 80 telescopes on and above Earth observed Deep Impact's rendezvous with Tempel 1, and their findings are shedding light on the comet's broader history in the solar system. Lisse's team is also comparing Spitzer's discoveries with those from the Stardust mission, which last January returned particles from the coma (or atmosphere) of comet Wild 2 back to Earth. "*We can compare the inferred composition of Tempel 1 to the Stardust sample returns and obtain a 'ground truth*,' " Lisse says. "*From this we can create a Rosetta stone, which we'll use to better understand the materials seen in our own solar system as well as around other stars*." Twelve of the 14 chemical species found by Spitzer match up with preliminary Stardust analyses, Lisse says, but several mysteries remain. For example, the Stardust samples do not yet include definitive evidence of the carbonate and clay minerals found in Tempel 1.

"*There's no reason to think Tempel 1 represents all comets*," he says. "*Deep Impact only hit and excavated Tempel 1 in one*

precise location, and Stardust only sampled the surface of one comet at one point in its orbit. We'll need additional missions to comets - such as robotic landing spacecraft or sample-return probes - to help us complete the picture."

TITAN'S PEBBLES 'SEEN' BY HUYGENS RADIO

An unexpected radio reflection from the surface of Titan has allowed ESA scientists to deduce the average size of stones and pebbles close to the Huygens' landing site. The technique could be used on other lander missions to analyze planetary surfaces for free. When Huygens came to rest on the surface of Titan on 14 January 2005, it survived the impact and continued to transmit to the Cassini mothership, orbiting above. Part of that radio signal 'leaked' downwards and hit the surface of Titan before being reflected back up to Cassini. On its way up, it interfered with the direct beam.

As Miguel Perez-Aycar, a member of the Huygens Team, and his colleagues watched the signal coming back, they were initially puzzled to see the power of the signal rising and falling in a repetitive manner.

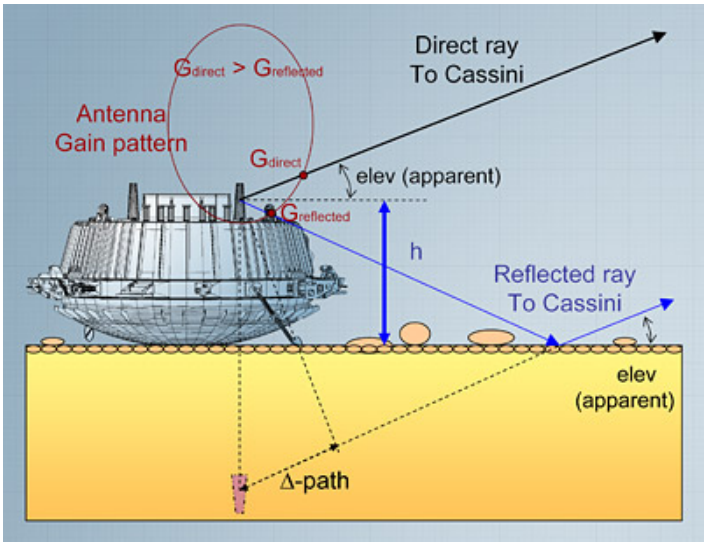
"Huygens had not been designed to necessarily survive impact so we had never thought about what the signal would look like from the surface," says Perez. After making a joke that aliens must be dragging the craft along the surface, Perez and the team began work at once to understand the signal.

The clue was the repetitive oscillation of the power. It made Perez think about the interaction of the direct signal with that reflecting from the surface of Titan. As Cassini traveled away from the Huygens landing site, the angle between it and Huygens changed. This altered the way in which the interference between the reflected and direct beams was detected, perhaps causing the variation in power. He began running computer models and saw that not only could he reproduce the received signal but also it was sensitive to the size of pebbles on the surface of Titan. Cassini collected data for 71 minutes after Huygens landed. After that time, the spacecraft's motion took it below the horizon as seen from Huygens' landing site. Until then, it soaked up radio signals that encoded information about a swathe of Titan's surface from 1 meter to 2 kilometers to the west of the landed probe.

To accurately mirror the true signal, Perez and his team discovered that the surface swathe must be relatively flat and covered mostly in stones of around 5-10 centimeters in diameter.

This unique result complements the data taken by the Descent Imager and Spectral Radiometer (DISR) instrument. When Huygens came to rest on the surface of Titan, DISR was pointing due south. Its images show stones and terrain in good agreement with the newly deduced western facing radio data. "*This is a real bonus to the mission. It requires no special equipment, just the usual communications subsystem*," says Perez.

Now that the scientists have understood the process using the unexpected Huygens data, the technique could be implemented on future lander missions. "This experience can be inherited by any future lander," says Perez, "*All that will be needed is a few refinements and it will become a powerful technique*."



By subtly altering the properties of the radio beam for instance, the radio transmitter and receiver can be optimized to help deduce the chemical composition of the planetary surface.

METHANE DRIZZLES ON SATURN'S MOON, TITAN

Liquid methane drizzles on the surface of Titan, a moon of Saturn, according to a paper by NASA and university scientists. Data from the Huygens probe indicates there is a lower, barely visible, liquid methane-nitrogen cloud that drops rain to the surface of Titan, reported a team of scientists. The probe collected the data on January 14, 2005, when it approached and landed on Titan. "*The rain on Titan is just a slight drizzle, but it rains all the time, day in, day out. It makes the ground wet and muddy with liquid methane. This is why the Huygens probe landed with a splat. It landed in methane mud*," said Christopher McKay, second author of the study. The principal author is Tetsuya Tokano.

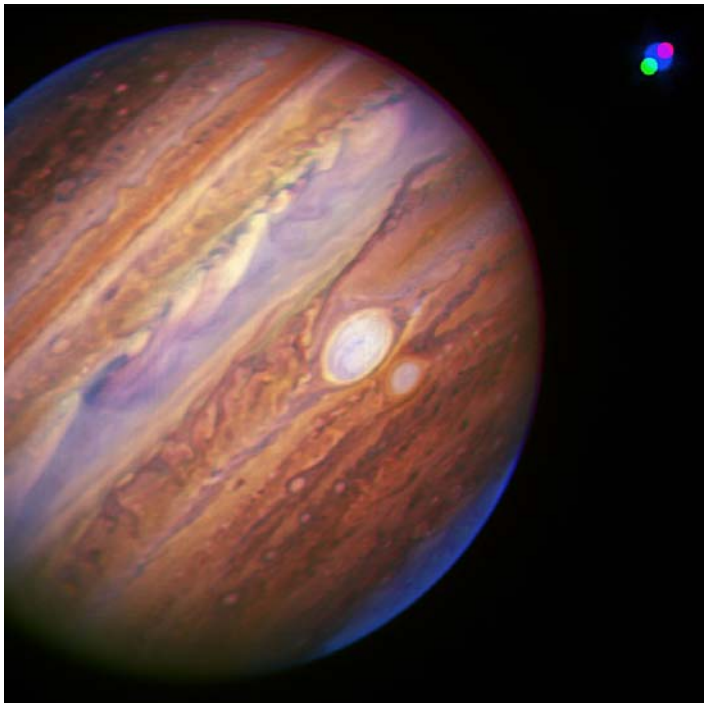
On Titan, the clouds and rain are formed of liquid methane. On Earth, methane is a flammable gas, but Titan has no oxygen in its atmosphere that could support combustion. Also, the temperatures on Titan are so cold -- minus 300 degrees Fahrenheit (minus 149 degrees Celsius) -- that the methane can form liquid. Titan's landscape includes fluvial, river-like features that may well be formed by methane rain, scientists noted. A gap separates the liquid methane cloud -- the source of the rain -- from a higher, upper methane ice cloud, according to the scientific study. Scientists say the downward flow of methane due to the rain is balanced by upward transport of methane gas by large-scale atmospheric circulation. According to scientists, the rain comes from thin clouds of methane. The upper clouds are methane ice, and the lower clouds are liquid and composed of a combination of methane and nitrogen. Computer models indicate these thin liquid methane clouds cover about half of Titan, even though methane abundance on the moon decreases with latitude, the team reported. "*We determined that the rain on Titan is equal to about two inches (about 5 centimeters) a year*," McKay said. "This is about as much rain as Death Valley (receives). The difference is (that) on Titan, this rain is spread out evenly over the entire year." The scientists reported that erosion potential from the very light methane drizzle may be quite limited, but at least would be sufficient to wet the surface material, and may explain its generally wet character.

PRE-LIFE MOLECULES PRESENT IN COMETS

The nitrogen bearing molecules in comets that crashed into Earth millions of years ago may have provided a sort of "pre-biotic jump start" to form the complex molecules that eventually led to life here, Bergin said. *"A lot of complex and simple biotic molecules have nitrogen and it's much easier to make complex molecules from atomic nitrogen*," Bergin said. "All DNA bases have atomic nitrogen in them, amino acids also have atomic nitrogen in them. By that statement what we're saying is if you have nitrogen in its simplest form, the atomic form, it's much more reactive and can more easily form complex prebiotic organics in space." These complex organics were incorporated into comets and were provided to the Earth. "*What we're seeing in space is telling us something about how you make molecules that led to us,"* Bergin said. Also of importance is the fact that odd anomalies in isotopic values in meteorites can also be explained if the nitrogen is not molecular, Bergin said.

KECK CAPTURES JUPITER'S RED SPOT JR. AS IT ZIPS PAST PLANET'S GREAT RED SPOT

Astronomers using the Keck Observatory in Hawaii this month snapped high-resolution near-infrared images of the Great Red Spot, a persistent, high-pressure storm on Jupiter, as a smaller storm, Red Spot Jr., breezed by it on its race around the planet. The image, which also shows Jupiter's moon Io, was taken on July 20 Hawaii time by the Keck II telescope on Mauna Kea using adaptive optics (AO) to sharpen the image. The spots are of interest to astronomers because Red Spot Jr. formed from the merger of three white spots only recently, between 1998 and 2000, and in December 2005 turned red like the much older Great Red Spot. While the new red spot is about the size of Earth, the Great Red Spot is nearly twice that diameter and has been circling the planet for at least 342 years.



The images captured by the second-generation Near Infrared Camera (NIRC2) on Keck II show that, though the two red spots are about the same color when seen in visible wavelengths (see Christopher Go's optical image from July 20 UT, http://redspotjr.christone.net/cg07200611-18c.jpg , they differ markedly at infrared wavelengths. When the astronomers viewed the planet through a narrow-band filter centered on the 1.58 micron, near-infrared wavelength, Red Spot Jr., which was called Oval BA before it changed from white to red, was a lot darker, indicating that the tops of the storm clouds may be lower than those of the Great Red Spot. With more atmosphere above its cloud tops, more infrared light is absorbed by molecules like methane in the atmosphere. "Red Spot Jr. is either not as high as the Great Red Spot, or it's just not as reflective, that is, as dense," said lead astronomer Imke de Pater, professor of astronomy at UC Berkeley. "These images will put some constraints on the altitude of Red Spot Jr." The Great Red Spot is thought to tower about 8 kilometers (5 miles) above the surrounding cloud deck. The fact that Red Spot Jr. turned red may indicate its swirling storm clouds are rising higher also, though apparently they are not as high as those of its larger companion, or the clouds are thinner.

Why the spots are red is a subject of great debate. Some people think the hurricane-like winds in the Great Red Spot, which can reach 400 miles per hour, dredge up material from deeper in the planet's atmosphere that, when exposed to ultraviolet light, turns red. One candidate is phosphine gas, PH3, which has been detected on Jupiter. Ultraviolet light might catalyze its conversion to red phosphorus, P4, according to one of the leading theories. Other, more complicated theories have phosphine interacting in the atmosphere with chemicals such as methane or ammonia to form complex compounds such as methylphosphane or phosphaethyne.

Recent studies suggest that the red color also may be attributed to sulfur allotropes, that is, different molecular configurations, including chains and rings, of pure sulfur, such as S3-S20. The new work hypothesizes that ammonium hydrosulfide particles are carried upwards in the Great Red Spot and are broken up by ultraviolet light. Subsequent chemical reactions ultimately lead to long-chained sulfur allotropes , which can vary in color from red to yellow. "The jury is still out on the exact processes that lead to the red coloration of the Great Red Spot -- and Oval BA," de Pater is quoted as saying in the August 2006 issue of Sky & Telescope magazine.

Christopher Go, an amateur astronomer who first noticed the coloration change of Red Spot Jr., joined de Pater's team earlier this year. He noted that during the close encounter between the two spots, Red Spot Jr. was squashed slightly, stretching in its direction of motion. The same thing happened in 2002 and 2004 when the Great Red Spot and Red Spot Jr. passed one another, though then Junior was white. The Great Red Spot rotates westward, opposite to the eastward rotation of the planet. Because alternating bands on the Jovian surface move in opposite directions, the adjacent Red Spot Jr. moves eastward. The planet rotates about once every 10 hours.

Another of de Pater's colleagues, mechanical engineering professor Philip Marcus, predicted several years ago that Jupiter's climate was changing, based on the disappearance of the cyclonic storms or spots within the bands. The mixing of the atmosphere by these cyclones keeps the temperature about the same over the entire planet, he argued, so loss of this mixing will cause the equator to heat up and the poles to cool.

Earlier this year, on April 16, de Pater and her team captured near-infrared, ultraviolet and visible light photos of the planet using the Hubble Space Telescope to look more closely at the two red spots. The observations with the Keck Telescope were a follow-up study to try to measure the speeds of the swirling winds in the spots. Jupiter's brightness, however, confused the adaptive optics system, forcing the astronomers to miss some good shots

of the planet as the guide star was being positioned optimally relative to Jupiter.

"This was probably the most challenging observation ever tried with the AO system at Keck," said de Pater, referring to use of the laser guide star system next to an object as bright as Jupiter. Adaptive optics can take the twinkle out of an object caused by thermal motion in the atmosphere, but to do this well, the target must be near another bright object that can serve as a reference. For some of the images, Jupiter's moon Io was used as the reference "star." But until Io got close enough for this, a laser guide star was created near Jupiter to serve this purpose.

"*This was our first attempt using the laser to obtain AO-corrected images of Jupiter's surface*," said Dr. Al Conrad, a support astronomer at the Keck Observatory. "*The technique shows promise and, if we perfect it, will provide us with many more opportunities to observe this fascinating, ever-changing object*."

The team also obtained a close-up of the two spots through a narrow-band filter centered on 5 microns, which samples thermal radiation from deep in the cloud layer. Both spots appear dark because the clouds completely block heat emanating from lower elevations, though narrow regions around the spots that are devoid of clouds show leakage of this heat out into space.

"*These 5 micron images reveal details in the cloud opacity not seen at the other wavelengths and will help unravel the vertical structure of the spots*," team member Michael Wong added. "The smooth, narrow arcs visible to the south of each spot probably result from the interaction between the spots and high-speed winds that are deflected around them." The resolution using both the narrow and wide views on the camera was about 0.1 arcseconds, or only half as good as can be obtained on a clear night with optimal seeing.

MARS' DUST STORMS MAY PRODUCE PEROXIDE SNOW

The planet-wide dust storms that periodically cloak Mars in a mantle of red may be generating a snow of corrosive chemicals, including hydrogen peroxide, that would be toxic to life, according to two new studies published in the most recent issue of the journal Astrobiology. Based on field studies on Earth, laboratory experiments and theoretical modeling, the researchers argue that oxidizing chemicals could be produced by the static electricity generated in the swirling dust clouds that often obscure the surface for months, said physicist Gregory T. Delory, first author of one of the papers. If these chemicals have been produced regularly over the last 3 billion years, when Mars has presumably been dry and dusty, the accumulated peroxide in the surface soil could have built to levels that would kill "life as we know it," he said. "*If true, this very much affects the interpretation of soil measurements made by the Viking landers in the 1970s*," said Delory. A major goal of the Viking mission, comprised of two spacecraft launched by NASA in 1975, was testing Mars' red soil for signs of life. In 1976, the two landers aboard the spacecraft settled on the Martian surface and conducted four separate tests, including some that involved adding nutrients and water to the dirt and sniffing for gas production, which could be a telltale sign of living microorganisms.

The tests were inconclusive because gases were produced only briefly, and other instruments found no traces of organic materials that would be expected if life were present. These results are more indicative of a chemical reaction than the presence of life, Delory said. "*The jury is still out on whether there is life on Mars, but it's clear that Mars has very chemically reactive conditions in the soil*," he said. "*It is possible there could be long-term corrosive effects that would impact crews and equipment due to oxidants in the Martian soil and dust*."

All in all, he said, "*the intense ultraviolet exposure, the low temperatures, the lack of water and the oxidants in the soil would make it difficult for any microbe to survive on Mars*."

The article by Delory and his colleagues demonstrates that the electrical fields generated in storms and smaller tornadoes, called dust devils, could split carbon dioxide and water molecules apart, allowing them to recombine as hydrogen peroxide or more complicated superoxides. All of these oxidants react readily with and destroy other molecules, including organic molecules that are associated with life. A second paper, coauthored by Delory, demonstrates that these oxidants could form and reach such concentrations near the ground during a storm that they would condense into falling snow, contaminating the top layers of soil. According to lead author Sushil K. Atreya, the superoxidants not only could destroy organic material on Mars, but accelerate the loss of methane from the atmosphere.

Delory and his colleagues have been studying dust devils in the American Southwest to understand how electricity is produced in such storms and how the electric fields would affect molecules in the air - in particular, molecules like those in the thin Martian atmosphere. "*We are trying to look at the features that make a planet habitable or uninhabitable, whether for life that developed there or for life we bring there*," he said. Based on these studies, he and his colleagues used plasma physics models to understand how dust particles rubbing against one other during a storm become positively and negatively charged, much the way static electricity builds up when we walk across a carpet, or electricity builds in thunderclouds. Though there's no evidence for lightning discharges on Mars, the electric field generated when charged particles separate in a dust storm could accelerate electrons to speeds sufficient to knock molecules apart, Delory and his colleagues found. "*From our field work, we know that strong electric fields are generated by dust storms on Earth. Also, laboratory experiments and theoretical studies indicate that conditions in the Martian atmosphere should produce strong electric fields during dust storms there as well*," said co-author Dr. William Farrell.

Since water vapor and carbon dioxide are the most prevalent molecules in the Martian atmosphere, the most likely ions to form are hydrogen, hydroxyl (OH) and carbon monoxide (CO). One product of their recombination, according to the second study, would be hydrogen peroxide (H_2O_2). At high enough concentrations, the peroxide would condense into a solid and fall out of the air.

If this scenario has played out on Mars for much of its history, the accumulated peroxide in the soil could have fooled the Viking experiments looking for life. While the Labeled Release and the Gas Exchange experiments on the landers detected gas when water and nutrients were added to Martian soil, the landers' Mass Spectrometer experiment found no organic matter. At the time, researchers suggested that very reactive compounds in the soil, perhaps hydrogen peroxide or ozone, could have produced the measurements, imitating the response of living organisms. Others suggested a possible source for these oxidants: chemical reactions in the atmosphere catalyzed by ultraviolet light from the sun, which is more intense because of Mars' thin atmosphere. The predicted levels were far lower than needed to produce the Viking results, however. Production of oxidants by dust storms and dust devils, which seem to be common on Mars, would be sufficient to cause the Viking observations, Delory said. Thirty years ago, some researchers considered the possibility that dust

storms might be electrically active, like Earth's thunderstorms, and that these storms might be a source of the new reactive chemistry. But this had been untestable until now.

"*The presence of peroxide may explain the quandary we have had with Mars, but there is still a lot we don't understand about the chemistry of the atmosphere and soils of the planet*," he said. The theory could be tested further by an electric field sensor working in tandem with an atmospheric chemistry system on a future Mars rover or lander, according to the team members.

LIFE-LONG INTEREST IN METEORITES PAYS OFF FOR B.C. WOMAN

The first new meteorite identified in Canada this year is also one of the smallest ever found in the country and is the highlight of a British Columbia woman's life-long interest in space rocks, after she discovered the specimen in 1968. The University of Calgary-based Prairie Meteorite Search has confirmed that a weathered chunk of iron Renee Johnson picked up while hunting for Christmas trees with her husband near Prince Rupert, B.C. nearly 38 years ago is of extra-terrestrial origin. "*I first picked it up because I noticed the unusual shape like an arrowhead, but when I held it I felt how dense it was*," Johnson said. "*When I was a little girl of about eight in The Netherlands, I remember my father telling me that you will always know a meteorite because it is heavy for its size. I always kept it and showed it to people, saying that I had found something unusual*." The identification was made by Adrian Karolko, the Prairie Meteorite Searcher for 2006, when Johnson brought it to a show-and-tell in Kelowna, where she now lives, on July 19. "*The shape of the rock was very distinctive even though it was weathered*," Karolko said. "*It is amazing that she kept it for so long. I really didn't expect that I would identify a meteorite this summer, but it turned out to be easy*."

The meteorite is five centimeters long and weighs only 40 grams. Johnson's meteorite is the fifth meteorite identified from British Columbia and the province's first meteorite "find." (Meteorites are classified as "falls" when pieces are found after a fireball is witnessed, or "finds" when it isn't seen.) It is the 69th meteorite recovered in Canada, and marks the modest milestone of being the 10th new meteorite discovered by the Prairie Meteorite Search since it began in 2000. The Prairie Search has now identified approximately 15 per cent of all the meteorites ever found in Canada. Karolko took the rock back to the University of Calgary, where Dr. Alan Hildebrand, project leader confirmed its origin by finding abundant nickel in the meteorite's interior.

Renee Johnson with her meteorite find. Photo by Alan Hildebrand, University of Calgary.

"*It's remarkable the way that Renee's find stretched across her life from being told about them by her father when a young child, to finding it when she was 31, to now having it identified in 2006 six decades after first learning about them*," Hildebrand said. Dr. Stephen Kissin will now study the meteorite further to determine its exact composition and classification.

The Prairie Meteorite Search consists of local publicity and visits by the Prairie Meteorite Searcher to towns to show meteorite specimens and to identify possible meteorites brought in by interested rock owners. Adrian Karolko is currently organizing more shows across southern British Columbia before returning to his studies at the University of Calgary in September. "*I've had a great turnout so far, and encourage everyone with a rock that they are wondering about to bring it in,"* Karolko said. "*We are sure that many more people have found meteorites that haven't yet been identified*."

BABY 'PLANEMOS' CAN BE BORN AS TWINS

Discovery of planetary masses in orbit of one another thrills astronomy community team led by a U of T astronomy professor is challenging an existing theoretical model and thrilling the astronomy community with its discovery of a seven-Jupiter-mass companion next to a planemo, or planetary mass object, only twice as heavy. Both objects have masses similar to those of extra-solar giant planets, usually found in orbit around a star. Unexpectedly, these bodies appear to circle each other. "*This is a truly remarkable pair of twins -- each weighing some hundred times less than our sun*," says Ray Jayawardhana. "*Their mere existence is a surprise, and their origin and fate a bit of a mystery*." The researchers discovered the companion candidate in an optical image taken with the European Southern Observatory's 3.5-meter New Technology Telescope on La Silla, Chile, and investigated it further with optical spectra and infrared images obtained with ESO's 8.2-meter Very Large Telescope on Paranal, Chile. These follow-up observations confirmed that both objects are young, at the same distance, and much too cool to be stars. By comparing the companion to widely used theoretical models, Jayawardhana and Ivanov estimate that it weighs about seven times as much as Jupiter, while the primary planemo is an estimated 14 times Jupiter's mass. The newborn pair, barely a million years old, are separated by about six times the distance between the sun and Pluto, and are located in the Ophiuchus star-forming region approximately 400 light years away.

"*Roughly half of all sun-like stars, and about a sixth of brown dwarfs, come in pairs*," says Jayawardhana. Brown dwarfs are 'failed stars' that weigh less than 75 Jupiter masses and are unable to sustain nuclear fusion. "*Oph 162225-240515, or Oph1622 for short, is the first planemo to be resolved into a double*." The existence of this wide pair poses a challenge to a popular theory which suggests that brown dwarfs and planemos are embryos ejected from multiple proto-star systems. Since the two objects in Oph1622 are so far apart, and only weakly bound to each other by gravity, they would not have survived such a chaotic birth. Planets are thought to form out of disks of gas and dust that surround stars, brown dwarfs and even some planemos. The researchers think that these planemo twins formed together out of a contracting gas cloud that fragmented, like a miniature stellar binary. "*We are resisting the temptation to call it a 'double planet' because this pair probably didn't form the way that planets in our solar system did*," says Ivanov. "*Now we're curious to find out whether such pairs are common or rare. The answer could shed light on how free-floating planetary-mass objects form*."

ASTRONOMERS CRUNCH NUMBERS, UNIVERSE GETS BIGGER

That intergalactic road trip to Triangulum is going to take a little longer than you had planned. An astronomer and his colleagues have determined that the Triangulum Galaxy, otherwise known as M33, is actually about 15 percent farther away from our galaxy than previously measured. This finding implies that the Hubble constant, a number that astronomers rely on to calculate a host of factors -- including the size and age of the universe -- could be significantly off the mark as well. That means that the universe could be 15 percent bigger and 15 percent older than any previous calculations suggested. The astronomers came to this conclusion after they invented a new method for calculating intergalactic distances, one that is more precise and much simpler than standard methods. Kris Stanek, associate professor of astronomy at Ohio State, and his coauthors describe the method in a paper to appear in the Astrophysical Journal (astro-ph/0606279).

In 1929, Edwin Hubble formulated the cosmological distance law that determines the Hubble constant. Scientists have disagreed about the exact value of the constant over the years, but the current value has been accepted since the 1950s. Astronomers have discovered other cosmological parameters since then, but the Hubble constant and its associated methods for calculating distance haven't changed. "*The Hubble constant used to be the one parameter that we knew pretty well, and now it's lagging behind. Now we know some things quite a bit better than we know the Hubble constant*," Stanek said. "*Ten years ago, we didn't even know that dark energy existed. Now we know how much dark energy there is -- better than we know the Hubble constant, which has been around for almost 80 years*."

To their surprise, the distance to two stars in M33 was 15 percent farther than they expected. If this new distance measurement is correct, then the true value of the Hubble constant may be 15 percent smaller -- and the universe may be 15 percent bigger and older -- than previously thought. Still, Stanek said he and his colleagues didn't start this work in order to change the value of the Hubble constant. They just wanted to find a simpler way to calculate distances. To calculate the distance to a faraway galaxy using the Hubble constant, astronomers have to work through several complex steps of related equations, and incorporate distances to closer objects, such as the Large Magellanic Cloud. "*In every step you accumulate errors*," Stanek said. "*We wanted an independent measure of distance -- a single step that will one day help with measuring dark energy and other things*."

The new method took 10 years to develop. They studied M33 in optical and infrared wavelengths, checking and re-checking measurements that are normally taken for granted. They used telescopes of all sizes, from fairly small 1-meter telescopes to the largest in the world -- the 10-meter telescopes at the Keck Observatory in Hawaii . "*Technologically, we had to be on the cutting edge to make this work, but the basic idea is very simple*," he said. They studied two of the brightest stars in M33, which are part of a binary system, meaning that the stars orbit each other. As seen from Earth, one star eclipses the other every five days. They measured the mass of the stars, which told them how bright those stars would appear if they were nearby. But the stars actually appear dimmer because they are far away. The difference between the intrinsic brightness and the apparent brightness told them how far away the stars were -- in a single calculation. To their surprise, the distance was 15 percent farther than they expected: about 3 million light-years away, instead of 2.6 million light-years as determined by the Hubble constant.

If this new distance measurement is correct, then the true value of the Hubble constant may be 15 percent smaller -- and the universe may be 15 percent bigger and older -- than previously thought. "*Our margin of error is now 6 percent, which is actually pretty good*," Stanek said. Next, they may do the same calculation for another star system in M33, to reduce their error further, or they may look at the nearby Andromeda galaxy. The kind of binary systems they are looking for are relatively rare, he said, and getting all the necessary measurements to repeat the calculation would probably take at least another two years.

SPITZER DIGS UP TROVES OF POSSIBLE ORION SOLAR SYSTEMS

Astronomers have long scrutinized the vast and layered clouds of the Orion nebula, an industrious star-making factory visible to the naked eye in the sword of the famous hunter constellation. Yet, Orion is still full of secrets. A new image from Spitzer Space Telescope probes deep into the clouds of dust that permeate the nebula and its surrounding regions. The striking false-color picture shows pinkish swirls of dust speckled with stars, some of which are orbited by disks of planet-forming dust. Spitzer, with its powerful infrared vision, was able to unearth nearly 2,300 such planet- forming disks in the Orion cloud complex, a collection of turbulent star-forming clouds that includes the well-known Orion nebula. The disks - made of gas and dust that whirl around young suns - are too small and distant to be seen by visible-light telescopes; however, the infrared glow of their warm dust is easily spotted by Spitzer's infrared detectors. Each disk has the potential to form planets and its own solar system. "*This is the most complete census of young stars with disks in the Orion cloud complex*," said Dr. Thomas Megeath, who led the research. "*Basically, we have a census of potential solar systems, and we want to know how many are born in the cities, how many in small towns, and how many out in the countryside*."

A look at Orion's demographics reveals that the potential solar systems populate a variety of environments. Megeath and his colleagues found that about 60 percent of the disk- sporting stars in the Orion cloud complex inhabit its bustling "cities," or clusters, containing hundreds of young stars. About 15 percent reside in small outer communities, and a surprising 25 percent prefer to go it alone, living in isolation.

Prior to the Spitzer observations, scientists thought that up to 90 percent of young stars, both with and without disks, dwelled in cities like those of Orion. "*The Orion image shows that many stars also appear to form in isolation or in groups of just a few stars*," said team member Dr. John Stauffer. "*These new data may help us to determine the type of environment in which our sun formed*." Astronomers do not know whether our middle-aged sun grew up in the stellar equivalent of the city or countryside, though most favor a large city scenario. Newborn stars like the ones in Orion tend to drift away from their siblings over time, so it is hard to trace an adult star's origins. Megeath and his colleagues estimate that about 60 to 70 percent of the stars in the Orion cloud complex have disks. "*It is an interesting question why this number isn't 100 percent. Eventually, we may be able to understand why some stars don't have disks*," said Megeath. Spitzer's infrared vision also dug up 200 stellar embryos in the Orion cloud complex, most of which had never been seen before. Stellar embryos are still too young to have developed disks. The Orion cloud complex is about 1,450 light-years from Earth and spans about 240 light-years of space. Spitzer's wide field of view allowed it to survey most of the complex, an area of the sky equivalent to 28 full moons. The featured image shows a slice of this survey, the equivalent of four full moons-worth of sky, and includes the Orion nebula itself.

CASSINI FINDS LAKES ON TITAN'S ARCTIC REGION

The Cassini spacecraft has found lakes on Saturn's moon Titan. The lakes are most likely the source of hydrocarbon smog in the frigid moon's atmosphere. Finding the source of the complex soup of hydrocarbons in Titan's atmosphere has been a major goal for the Cassini mission and is a significant accomplishment. Numerous well-defined dark patches resembling lakes are present in radar images of Titan's high latitudes taken during a July 22 flyby. At Titan's frigid temperatures, about minus 180 degrees Celsius, the liquids in the lakes are most likely methane or a combination of methane and ethane. "*This is a big deal*," said Steve Wall, deputy radar team leader. "*We've now seen a place other than Earth where lakes are present*."

This area of Titan has been in winter's shadow since before Cassini arrived, and the spacecraft had not flown over it before. During the flyby, Cassini's radar spotted several dozen lakes as small as 0.6 miles wide, with some nearly 20 miles wide. The biggest lake is about 62 miles long and may be only partly wet. "*What we see is darker than anything we've ever seen elsewhere on Titan. It was almost as though someone laid a bull's-eye around the whole north pole of Titan, and Cassini sees these regions of lakes just like those we see on Earth*," said Larry Soderblom, Cassini interdisciplinary scientist. "Titan has turned out to be like a musical crescendo -- each pass is more exciting than the last."

Titan has not yielded its secrets easily because the dense smoggy atmosphere makes it very difficult to obtain good visible images. Radar can penetrate the smog and obtain clear images. Dark regions in radar images generally mean smoother terrain, while bright regions mean a rougher surface. Some of the new radar images show channels leading in or out of a variety of dark patches. The shape of the channels also strongly implies they were carved by liquid. Some of the dark patches and connecting channels are completely black -- they reflect back essentially no radar signal, which means they must be extremely smooth and might contain liquid. In some cases rimscan be seen around the dark patches, suggesting deposits that might form as liquid evaporates.

Scientists had predicted, but had no confirmation until now, that pools of liquid were contributing to the high concentration of methane and other hydrocarbons in Titan's atmosphere. "*We've always believed Titan's methane had to be maintained by liquid lakes or extensive underground 'methanofers,' the methane equivalent of aquifers. We can't see methanofers but we can now say we've seen lakes*," said Jonathan Lunine, Cassini interdisciplinary scientist. Since lakes come and go with the seasons, they wax and wane over time, and winds might alter the roughness of their surfaces. Repeat coverage of these areas is expected to provide more information on these lakes. By passing over a lake in a different direction, Cassini may see the effect of prevailing winds in the changing brightness of the lake surface. On later passes toward the end of its prime mission, Cassini might see changes in the shape or size of lakes as winter yields to spring in the northern hemisphere. Cassini's next flyby is on September 7. In October, Cassini's radar will look even closer to the north pole, searching for more lakes and mapping more of the polar region covered by these features.

IAU DRAFTS DEFINITION OF "PLANET" AND "PLUTONS"

The world's astronomers, under the auspices of the International Astronomical Union (IAU), have concluded two years of work defining the difference between "planets" and the smaller "solar system bodies" such as comets and asteroids. If the definition is approved by the astronomers, our Solar System will include 12 planets, with more to come: eight classical planets that dominate the system, three planets in a new and growing category of "plutons" - Pluto-like objects - and Ceres. Pluto remains a planet and is the prototype for the new category of "plutons."

IAU President Ron Ekers explains the rational behind a planet definition: "*Modern science provides much more knowledge than the simple fact that objects orbiting the Sun appear to move with respect to the background of fixed stars. For example, recent new discoveries have been made of objects in the outer regions of our Solar System that have sizes comparable to and larger than Pluto. These discoveries have rightfully called into question whether or not they should be considered as new 'planets.'* "

The proposed description the planet definition, states ***"A planet is a celestial body that (a) has sufficient mass for its self-gravity to overcome rigid body forces so that it assumes a hydrostatic equilibrium (nearly round) shape, and (b) is in orbit around a star, and is neither a star nor a satellite of a planet."*** Member of the Planet Definition Committee, Richard Binzel says: "*Our goal was to find a scientific basis for a new definition of planet and we chose gravity as the determining factor. Nature decides whether or not an object is a planet*."

According to the new draft definition, two conditions must be satisfied for an object to be called a "planet." First, the object must be in orbit around a star, while not being itself a star. Second, the object must be large enough (or more technically correct, massive enough) for its own gravity to pull it into a nearly spherical shape. The shape of objects with mass above 5 x 1020 kg and diameter greater than 800 km would normally be determined by self-gravity, but all borderline cases would have to be established by observation.

If the proposed Resolution is passed, the 12 planets in our Solar System will be Mercury, Venus, Earth, Mars, Ceres, Jupiter, Saturn, Uranus, Neptune, Pluto, Charon and 2003 UB313. The name 2003 UB313 is provisional, as a "real" name has not yet been assigned to this object. A decision and announcement of a new name are likely not to be made during the IAU General Assembly in Prague, but at a later time. The naming procedures depend on the outcome of the Resolution vote. There will most likely be more planets announced by the IAU in the future. Currently a dozen "candidate planets" are listed on IAU's "watchlist" which keeps changing as new objects are found and the physics of the existing candidates becomes better known.

FROM THE EDITOR'S TERMINAL

The Stargazer is your newsletter and therefore it should be a cooperative project. Ads, announcements, suggestions, and literary works should be received by the editor 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.

The Star Gazer
P.O. Box 12746
Everett, WA 98206

In August's StarGazer:

The next EAS Meeting is 6:30 P.M. <u>WEDNESDAY</u>, August 16th 2006 at the Everett Public Library Auditorium. <u>NOTE MID-WEEK DATE</u> !!!