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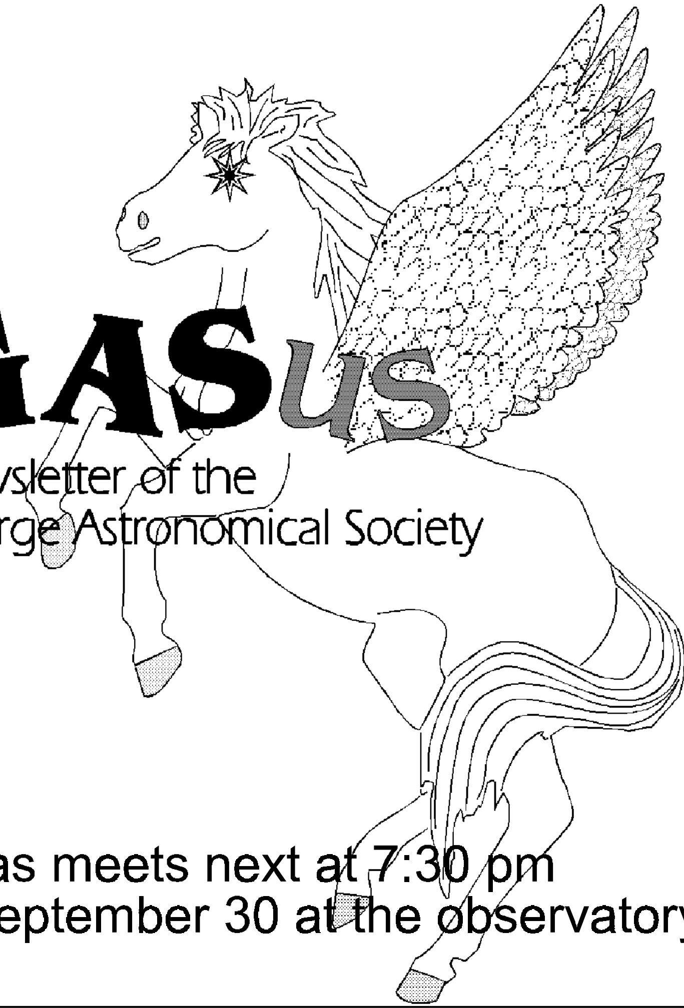


the

PeGASus

Newsletter of the
The Prince George Astronomical Society

The pgas meets next at 7:30 pm
Wednesday September 30 at the observatory

INSIDE :

the PeGASus is published monthly by the *Prince George Astronomical Society*.

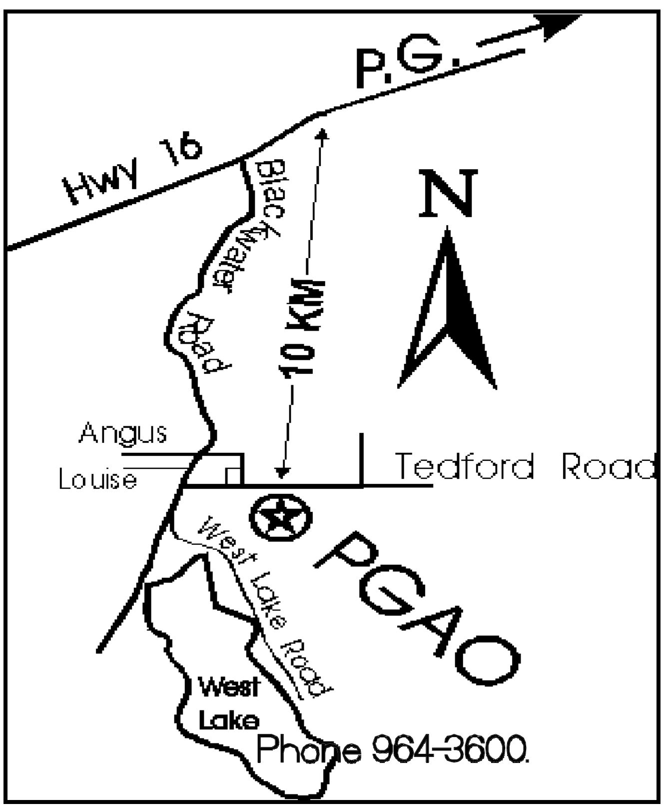
Our pursuits are out of this world.
Our activities are astronomical.
Our aim is the sky.

Contributions to the newsletter are welcome.

Deadline for the next issue is

OCT 16

Send correspondence to
The PGAS
3330 - 22nd Avenue
Prince George, BC, V2N 1P8
or
fancy@netbistro.com



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Editorial

By Gil Self

Once again we are enjoying our fall observing season, as you read this the fall equinox has passed a week ago. An evening of observing doesn't mean waiting until midnight for some darkness. One can spend an pleasant evening and still get enough sleep to arrive at work in the morning on time—and awake!

The 24 inch is working superbly although the setting circles are a little cranky. I need to do a little work on them in the very near future. But the real "star" (no pun intended) is the new C-8 patio mount. If you haven't tried it yet you really should pop the Celestron on and try it out. It takes about 5 minutes to set it up. A very easy to use telescope and no dome to get in the way. Just a few minor improvements here and I think this setup will be used even more than the 24 inch.

If you don't get the newsletter on time it is my fault, I played hooky last night and spent the evening at the observatory when I should have been writing this. It was a fairly clear evening, not the best of viewing. There was a fair amount of moisture in the air, with the moisture the sky was not very dark, M-51 was just a smudge. Except for Andromeda, galaxies where not worth the trouble to find them.

But, as is usually the case, a draw back in one area probably means a benefit in some other area. I have never seen Jupiter quite as good as last night. The contrast was excellent the equatorial bands where clearly visible, even the air was almost stable.

The NOVA program will be starting shortly. If you would like to learn more on the basics of astronomy and telescope usage just give Jon Bowen a call. This course is available to club members at no charge. It is also open to the general public for a small fee so tell your friends!

Our yearly club fees are due in September. The cost of being a member is still a bargain but if you can look after them soon it really helps us with budgeting our club expenses.

We are at this time looking into costs on a new , simpler method of photography. It is a variation on electronic photography and it appears to be in our price range. One of the prime benefits of this system is that it is very straight forward to use and therefore available to all. If you still feel uneasy about using the ccd than this method should be what you need ...more details at the September meeting.

And last of all I want to mention the fine of Brian, Judy and their staff down at Spee-Dee. If you missed it take a look at last months newsletter a good example of the high quality work they do at Spee-Dee. And this month like almost any other month, I send the newsletter in late and they come through in short order and let me get the newsletter out to you on time—- Thanks folks G.S.

PS -no proofreading this issue the mistakes are all mine..

Coming Events

If you are involved with any astronomical or otherwise scientific activity on behalf of the PGAS, please list the activity here.

September 30 — General meeting at PGAO

The Night Sky for September '98

by Bob Nelson, PhD
Hi Folks,

By the time you read this, my wife Lois and I should be on our eight-week trip to the British Isles and Ireland!! (We're taking a semester off work at the College and will be on half pay all year.) As I write this (in mid-May), our "game plan" is to start out in Scotland for a week of hiking and seeing the sights (while the good weather holds), move over to Ireland for a couple of weeks for much of the same, and then return to Britain, possibly visiting the Snowdonia area of Wales, the Lake District of England and other attractions. The great city of London is, of course, a big "draw" with its many museums, theatres, cultural icons and historical exhibits. Although I was born near there and still vaguely think of it as home, I haven't returned in my adult life. I'm sure we'll find it strange and exciting -- familiar, but yet foreign.

I haven't forgotten the astronomical sites. On my list is the Royal Greenwich Observatory, Jodrell Bank, and Birr Castle, Ireland (which is the site of Lord Rosse's 72" telescope, recently restored). I hope to take slides of these and all the trip highlights, to be shown at a later date. I may also call in to various club meetings, etc. as appropriate. Anyone may contact me at my international e-mail site: nelson_bob@hotmail.com and I do look forward to receiving messages from all my friends. I plan to sign on at an internet cafe once a week or so and can therefore answer messages and generate a few of my own. I also plan to write a mini travelogue to be sent to those who request it. In the meantime, I've written four Night Skies in advance and passed them on to Gil. All this fall, I will make Gil's deadlines!!!

In May, I believe that I and others were able to tune up the 24" so that it is working better than it ever has. The drive gears (in that little set) were firmly silver-soldered to their shafts (courtesy of Don Morrison in the CNC welding shop) and hopefully should give us no more problems. There is a new plywood coarse-adjust mechanism for the 3" guide scope (with the ST4 autoguider) that should work effectively (at time of writing, it works but seems to over-correct, working within a 10 arcsec or so box). The telescope is now properly balanced once again, yielding smoother operation. Again, at time of writing, I was tuning up the NGC Max setting circles so that they will be more accurate. Also, I have fine-tuned the collimation so that the star images on the CCD camera are perfectly centred (with the brightest pixel at the centre). Star profile modelling on a spreadsheet yielded full-width-at-half-maximum to be some 4 arcseconds (higher than expected but not as high as in some of Jack Newton's images). On a night of good seeing, I was able to spit the "Double-Double" (Epsilon1-2 Lyrae) -- some 2.3 and 2.7 arcsec We should now be able to do some tests regarding improving the dome "seeing" (the installation of fans comes to mind). Also, the polar alignment has been tuned up -- it's now good for 10-15 minutes of unguided cass-focus photography if you fine-tune the speed adjustment. Lastly, this summer, we hope to have had the 24" mirror re-aluminized -- something that has not been done since we got the mirror in 1984 (big observatories do it every couple of years). Dramatic improvements in image brightness and clarity should result.

Also, this spring/summer, I was able to determine the times of minima of a number of eclipsing binaries and I hope to have submitted a paper before I leave. On the coming observing front (I won't be doing too much observing myself unless I get lucky), we are approaching the better observing conditions of fall, when the darkness comes sooner but yet when there are still good spells of clear weather and the evenings are not yet cold. As usual, all descriptions are for the 15th of the month, unless otherwise noted.

PLANET ROUNDUP

MERCURY, a morning object in September, rises an hour or more before sunrise for the early part of the month but reaches superior conjunction on the 25th. Because of the orientation of the ecliptic (where the Sun and most of the planets reside) to the celestial equator, this is a favourable apparition. Mercury varies from a disk of diameter 7" to 5.2" (1st and 15th resp.) of magnitude - 0.3 to -1.3 (same dates). If you're an early riser, look for Mercury with binoculars in the eastern sky.

VENUS, a morning object in September, rises about an hour before sunrise. It's a 10.0" disk of magnitude -3.9. On September 10, observers are in for a big treat, as the two planets pass within 0.5 degrees of one another (Mercury is the upper object). Also, a few days earlier, when the two planets are a little further apart, the star Regulus makes the group a fine triple. For you photographers that rise early, this should be a fine event.

MARS, in Cancer (until the 17th when it passes into Leo), rises at about 3 A.M. (PDT) and is in the southeast at dawn. It's a 4.0" disk of magnitude 1.7.

JUPITER, in Pisces (until the 13th when it passes into Aquarius), rises at sunset and sets at dawn. It's a 49.7" disk of magnitude -2.9. It reaches opposition on the 15th (8 PM PDT).

SATURN, in Cetus (until the 12th when it retrogrades back into Pisces), rises around 9 P.M. and is up all night. It's a 19.5" disk of magnitude -0.1.

URANUS, in Capricornus, is low in the southeast at sunset and sets around 3 A.M. (PDT). It's a 3.7" disk of magnitude 5.7.

NEPTUNE, in Capricornus until the 6th when it moves into Sagittarius, rises at about 4:30 PM and sets at about 12:50 AM. As usual, it's a 2.3" disk at about magnitude 7.9.

PLUTO, in Scorpius until the 12th when it moves back into Ophiuchus, rises at about 11:45 AM and sets at about 10 PM. As usual, it's a 0.1" disk at magnitude 13.8.

The Fall Equinox occurs on Sept 22 at 22:37 PDT.

CONSTELLATIONS to look for in September (at 9:00 PM, PDT) are Sagittarius, Scutum, Serpens Cauda, Sagitta, and Lyra.
In Sagittarius (Sqr, "The Archer"), we see the richest part of the Milky Way since we are looking towards the centre of the Galaxy (located at 17 h 46 m, -29 00'). There are many wonderful sights which, unfortunately for us in P.G., are low in the southern sky and therefore hard to observe. Nevertheless, look for M8 (the "Lagoon Nebula", disc'd by LeGentil in 1747 and lying some 800 light years from us), M17 (the "Swan" or "Omega" Nebula, disc'd by de Cheseaux in 1764 and lying some 5700 light years from us), M20 (the "Trifid" Nebula, disc'd by Legentil in 1747 and lying some 5200 light years from us), M22 (a wonderful globular, disc'd by Abraham Ihle in 1665, containing some 500,000 stars and lying some 22,000 light years from us), M28 (globular cluster, disc'd by Messier in 1764 and lying some 15,000 light years from us), M55 (loose globular cluster), M21, M54, M69, M70, M75, (small globular clusters), M23, M24, M25, M18 (small open clusters). Also, there are many fine NGC objects too numerous to mention.
Scutum (Sct, "The Shield") is a small constellation just to the north of Sagittarius. It contains two Messier objects and a few other things.
Serpens Cauda (Ser, "The Serpent"), just northwest of Scutum, contains little of interest as does Aquila to the east and Delphinus, even further east (left).
Sagitta (Sge, "The Arrow"), a small constellation to the north of Aquila contains M71, a fine globular cluster.

Lyra (Lyr, "The Harp")-- I'll leave this for a later date (but look for M57 and the "Double- Double").

Clear skies (from afar),
-Bob

NEW BOOKS AT THE PUBLIC LIBRARY

Yvonne Whebell

THE YOUNG ASTRONOMER.

Harry Ford. DK Publishing, Inc.

This new book is a great tool for kids to learn about astronomy. It includes lots of photographs and projects that children can do, such as model making, keeping a diary of the moon, making and using a quadrant, and a simple means of mapping sunspots. Fun for kids and anyone who wants to help children learn about the stars and planets.

THE NASA ATLAS OF THE SOLAR SYSTEM.

Ronald Greeley and Raymond Batson.
Cambridge University Press.

This absolutely gorgeous and gargantuan book will be in our reference section within a couple of weeks. Based on spacecraft missions, it has digital, topographic, and geologic maps; photographs from various missions, photomosaics, and diagrams. The book includes a glossary and index, and a gazetteer of all the named features in the solar system. The authors write of the exploration of the solar system, mapping techniques, and describe the nature and history of the solar system in a non-technical manner.

Yvonne Whebell

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At the Eyepiece:
Two Magnificent Planetaries

The Ring Nebula, M57, repays careful study. The disk of the famous planetary nebula was easily visible in my old 60mm refractor and Edmontonian Larry Wood reports seeing the disc with his 80mm finder. Wood has even starhopped to the magnitude 9.0 object with 7x50 binoculars, although of course it appeared stellar at 7x.

While the famous "smoke ring" appearance may be hinted at in smaller telescopes, a 15-cm telescope is usually required to see the darker centre plainly and enjoy an esthetically satisfying view. My 20-cm Newtonian at 116x shows M57 to be fainter at the ends of the oval and brighter inside of the 80" by 60" gray annulus than outside of it. The magnitude 13 following star is usually visible.

Using Allegheny Observatory's 33-cm Fitz refractor at 600x, James Mullaney and Wallace McCall glimpsed the 15th magnitude central star. Walter Scott Houston accomplished this with Stellafane's 30-cm f/17 Porter telescope, but he didn't state what power he used.

While I have suspected the central star with smaller apertures myself, my 40-cm f/4.5 Dobsonian at 392x is the smallest telescope with which I've made a definite sighting. On the night that I saw it, I rated the seeing as excellent and the transparency as superb. There is a 15th magnitude star preceeding M57 by about 7". When that star was visible at 392x, the central star usually was as well, although the preceeding star is a little easier. Even much larger telescopes need about 400x to dim the nebulosity enough to reveal the central star, so very good to excellent seeing is always required for success. If the four stars of the nearby Double-double, Epsilon Lyrae, are crisp and well-separated, then you may have a night which will grudgingly give up the Ring Nebula's central white dwarf.
At 261x the 40-cm Newtonian showed a bright rim in M57 near to but south of the following star.

Surprisingly, in tests with the Prince George Observatory's 0.6-metre Cassegrain, neither a UHC filter nor an OIII filter showed any more details in the planetary nebula than were visible without a filter.

Year after year I viewed the Ring Nebula with John Casino's 0.9-metre Dobsonian at the Mount Kobau Star Party. On August 26, 1990 at 420x the giant Dobsonian showed me the central star, the other star inside the ring, and one foreground star superimposed on the ring. Then, in a moment of superior seeing, I saw broad parallel banding in the gauzy nebulosity inside the annulus, as the Mt. Palomar 5-metre photos show. I wasn't looking for the banding--it just flashed out. I've never again been favoured with such a view in many subsequent observations with the 0.9-metre; owner John Casino has never been so fortunate, either.

However, BURNHAM'S CELESTIAL HANDBOOK says: "Faint streaks traversing the ring were seen visually by Lord Rosse as early as 1844, and were first photographed with the Crossley reflector at Lick Observatory in 1899."

[The 0.9-metre Dobsonian was a fixture at the Mount Kobau and Table Mountain star parties for a decade. The telescope technician was no less than John Dobson himself--many afternoons Dobson could be seen, teflon pieces in hand, tweaking the great bearings. The telescope's loss in a flood several winters ago was a loss not only for the Casino's, but for all star party attendees.]

The pretty Albireo-like double Otto Struve 525 lies in the same low power field of view as M57, about a degree to the NNE. Its magnitude 6 and 7.5 components are a wide 45" apart.

Compare Otto Struve 525 to the real thing; no night of late summer observing is complete without a low power view of Albireo, that matchless pair of topaz and sapphire gems.

One of the more interesting objects in the sky is the Blinking Planetary, NGC 6826 in Cygnus. With direct vision, the central star almost overpowers the 25" wide nebula; with averted vision, the magnitude 9.8 planetary nebula becomes so bright that it completely hides the magnitude 10.4 central star. Alternate quickly from direct vision to averted vision and the central star blinks on and off. The effect can be seen to some degree in quite a few planetaries, but it works best in NGC 6826, perhaps because the disk is of equal luminosity all the way across its diameter. To me this planetary appeared white even with the 62-cm Cassegrain of the Goldendale Observatory in Washington state, but some observers saw a greenish tinge with that telescope. It "blinks" equally well whether using a 20-cm or a 62-cm telescope.

The wide double 16 Cygni (two 5th magnitude stars separated by 39") is in the Blinking Planetary's low power field, just to its west. Three other fainter pairs are in the field as well--all have about the same separation that 16 Cygni's stars do, while two pairs also sport components of equal brightness.

(Excerpted from Alan Whitman's RASC JOURNAL column)

12 GALILEO FINDS JUPITER'S RINGS FORMED BY DUST BLASTED OFF SMALL MOONS

Jupiter's intricate, swirling ring system is formed by dust kicked up as interplanetary meteoroids smash into the giant planet's four small inner moons, according to scientists studying data from NASA's Galileo spacecraft. Images sent by Galileo also reveal that the outermost ring is actually two rings, one embedded within the other.

The findings were announced today by scientists from Cornell University, Ithaca, NY, and the National Optical Astronomy Observatories (NOAO), Tucson, AZ, at a news briefing held at Cornell.

"We now know the source of Jupiter's ring system and how it works," said Cornell astronomer Dr. Joseph Burns, who reported on the first detailed analysis of a planet's ring system, along with Maureen Ockert-Bell and Dr. Joseph Veverka of Cornell, and Dr. Michael Belton of NOAO.

"Rings are important dynamical laboratories to look at the processes that probably went on billions of years ago when the Solar System was forming from a flattened disk of dust and gas," Burns explained. Furthermore, similar faint rings probably are associated with many small moons of the Solar System's other giant planets. "I expect we will see similar processes at Saturn and the other giant planets," Burns said.

In the late 1970s, NASA's two Voyager spacecraft first revealed the structure of Jupiter's rings: a flattened main ring and an inner, cloud-like ring, called the halo, both composed of small, dark particles. One Voyager image seemed to indicate a third, faint outer ring. New Galileo data reveal that this third ring, known as the gossamer ring because of its transparency, consists of two rings. One is embedded within the other, and both are composed of microscopic debris from two small moons, Amalthea and Thebe.

"For the first time we can see the gossamer-bound dust coming off Amalthea and Thebe, and we now believe it is likely that the main ring comes from Adrastea and Metis," Burns said. "The structure of the gossamer rings was totally unexpected," Belton added. "These images provide one of the most significant discoveries of the entire Galileo imaging experiment."

Galileo took three dozen images of the rings and small moons during three orbits of Jupiter in 1996 and 1997. The four moons display "bizarre surfaces of undetermined composition that appear very dark, red and heavily cratered from meteoroid impacts," Veverka said. The rings contain very tiny particles resembling dark, reddish soot. Unlike Saturn's rings, there are no signs of ice in Jupiter's rings.

Scientists believe that dust is kicked off the small moons when they are struck by interplanetary meteoroids, or fragments of comets and asteroids, at speeds greatly magnified by Jupiter's huge gravitational field, like the cloud of chalk dust that rises when two erasers are banged together. The small moons are particularly vulnerable targets because of their relative closeness to the giant planet.

"In these impacts, the meteoroid is going so fast it buries itself deep in the moon, then vaporizes and explodes, causing debris to be thrown off at such high velocity that it escapes the satellite's gravitational field," Burns said. If the moon is too big, dust particles will not have enough velocity to escape the moon's gravitational field. With a diameter of just five miles (eight kilometers) and an orbit that lies just at the periphery of the main ring, tiny Adrastea is "most perfectly suited for the job."

As dust particles are blasted off the moons, they enter orbits much like those of their source satellites, both in their size and in their slight tilt relative to Jupiter's equatorial plane. A tilted orbit wobbles around a planet's equator, much like a hula hoop twirling around a person's waist. This close to Jupiter, orbits wobble back and forth in only a few months.

Jupiter's diameter is approximately 86,000 miles (143,000 kilometers). The ring system begins about 55,000 miles (92,000 kilometers) from Jupiter's center and extends to about 150,000 miles (250,000 kilometers) from the planet.

LATEST LUNAR PROSPECTOR FINDINGS INDICATE LARGER AMOUNTS OF POLAR WATER ICE

The north and south poles of the Moon may contain up to six billion metric tons of water ice, a more than ten-fold increase over previous estimates, according to scientists working with data from NASA's Lunar Prospector mission.

Growing evidence now suggests that water ice deposits of relatively high concentration are trapped beneath the soil in the permanently shadowed craters of both lunar polar regions. The researchers believe that alternative explanations, such as concentrations of hydrogen from the solar wind, are unlikely.

Mission scientists also report the detection of strong, localized magnetic fields; delineation of new mass concentrations on the surface; and the mapping of the global distribution of major rock types, key resources and trace elements. In addition, there are strong suggestions that the Moon has a small, iron-rich core. The new findings are published in the Sept. 4 issue of Science magazine.

"The Apollo program gave us an excellent picture of the Moon's basic structure and its regional composition, along with some hints about its origin and evolution," said Dr. Carl Pilcher, science director for Solar System exploration in NASA's Office of Space Science, Washington, DC. "Lunar Prospector is now expanding that knowledge into a global perspective. The indications of water ice at the poles are tantalizing and likely to spark spirited debate among lunar scientists."

In March, mission scientists reported a water signal with a minimum abundance of one percent by weight of water ice in rocky lunar soil (regolith) corresponding to an estimated total of 300 million metric tons of ice at the Moon's poles. "We based those earlier, conscientiously conservative estimates on graphs of neutron spectrometer data, which showed distinctive dips over the lunar polar regions," said Dr. Alan Binder of the Lunar Research Institute, Gilroy, CA, the Lunar Prospector principal investigator.
"This indicated significant hydrogen enrichment, a telltale signature of the presence of water ice.

"Subsequent analysis, combined with improved lunar models, shows conclusively that there is hydrogen at the Moon's poles," Binder said. "Though other explanations are possible, we interpret the data to mean that significant quantities of water ice are located in permanently shadowed craters in both lunar polar regions.

"The data do not tell us definitively the form of the water ice," Binder added. "However, if the main source is cometary impacts, as most scientists believe, our expectation is that we have areas at both poles with layers of near-pure water ice." In fact, the new analysis "indicates the presence of discrete, confined, near-pure water ice deposits buried beneath as much as 18 inches (40 centimeters) of dry regolith, with the water signature being 15 percent stronger at the Moon's north pole than at the south."

How much water do scientists believe they have found? "It is difficult to develop a numerical estimate," said Dr. William Feldman, co-investigator and spectrometer specialist at the Department of Energy's Los Alamos National Laboratory, NM. "However, we calculate that each polar region may contain as much as three billion metric tons of water ice."

Feldman noted he had cautioned that earlier estimates "could be off by a factor of ten," due to the inadequacy of existing lunar models. The new estimate is well within reason, he added, since it is still "one to two orders of magnitude less than the amount of water predicted as possibly delivered to, and retained on, the Moon by comets," according to earlier projections by Dr. Jim Arnold of the University of California at San Diego.

In other results, data from Lunar Prospector's gamma ray spectrometer have been used to develop the first global maps of the Moon's elemental composition. The maps delineate large compositional variations of thorium, potassium and iron over the lunar surface, providing insights into the Moon's crust as it was formed. The distribution of thorium and potassium on the Moon's near side supports the idea that some portion of materials rich in these trace elements was scattered over a large area as a result of ejection by asteroid and comet impacts.

While its magnetic field is relatively weak and not global in nature like those of most planets, the Moon does contain magnetized rocks on its upper surface, according to data from Lunar Prospector's magnetometer and electron reflectometer. The resultant strong, local magnetic fields create the two smallest known magnetospheres in the Solar System.

"The Moon was previously interpreted as just an unmagnetized body without a major effect on what is going on in the solar wind," explained Dr. Mario Acuna, a member of the team located at NASA's Goddard Space Flight Center, Greenbelt, MD. "We are discovering that there is nothing simple about the Moon as an obstacle to this continuous flow of electrically charged gas from the Sun."

These mini-magnetospheres are located diametrically opposite to large impact basins on the lunar surface, leading scientists to conclude that the magnetic regions formed as the result of these titanic impacts. One theory is that these impacts produced a cloud of electrically charged gas that expanded around the Moon in about five minutes, compressing and amplifying the pre-existing, primitive ambient magnetic field on the opposite side. This field was then "frozen" into the surface crust and retained as the Moon's then-molten core solidified and the global field vanished.

Using data from Prospector's doppler gravity experiment, scientists have developed the first precise gravity map of the entire lunar surface. In the process, they have discovered seven previously unknown mass concentrations, lava-filled craters on the lunar surface known to cause gravitational anomalies. Three are located on the Moon's near side and four on its far side. Finally, Lunar Prospector data suggests that the Moon has a small, iron-rich core approximately 186 miles (300 kilometers) in radius, which is toward the smaller end of the range predicted by most current theories. "This theory seems to best fit the available data and models, but it is not a unique fit," cautioned Binder. "We will be able to say much more about this when we get magnetic data related to core size later in the mission." Ultimately, a precise figure for the core size will help constrain models of how the Moon originally formed.

Lunar Prospector was launched on Jan. 6, 1998, and entered lunar orbit on Jan. 11. After a one-year primary mission orbiting the Moon at a height of approximately 63 miles (100 kilometers), mission controllers plan to the lower the spacecraft's orbit substantially to obtain detailed measurements.

In the coming year, there are a great number of things to be done around the observatory to both improve it for the use of the members and to present a great face to the community. Donations of time and materials in the coming year will be highly appreciated as we work as a society to improve the capabilities of the equipment, and increase the comfort and usability of the building overall.

PGAS CONTRIBUTORS

The PGAS would like to thank the following individuals, corporations and government agencies who, since 1991, have donated money, goods or services to the construction and operation of the Prince George Astronomical Observatory.

Ministry of Adv. Ed. Training and Tech.	$25,000
BC Science Council	16,000
BC Lotteries	3,900
Helmar Kotsch (Acme Mas.)	1,932
Northwood Pulp and Timber	1,665
Electrical Services Ltd.	1,583
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Canfor Polar Division	744
Bisque Software	500
Xerox Canada	500
Canfor Clear Lake	500

The greatest contributors to the construction and operation of the observatory are from PGAS members who have generously contributed their time to this project. The value of their contribution surpasses all external contributions.

The PGAS is a non-profit organization dedicated to the advancement of astronomy and science in general in Prince George and the neighboring northern communities. Donations of money or materials to the society are greatly appreciated and tax deductible.

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