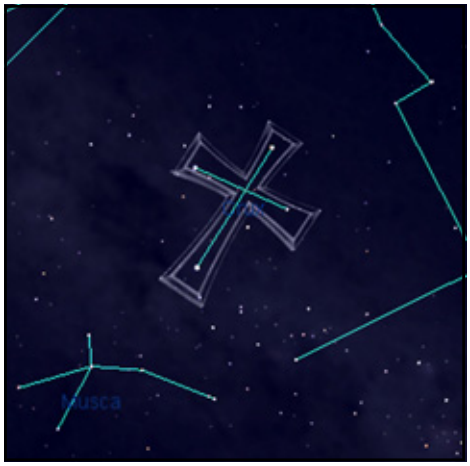
Inside Orbit

July 2006 **Volume XXXXII - Number II**

A Publication of the Grand Rapids Amateur Astronomical Association



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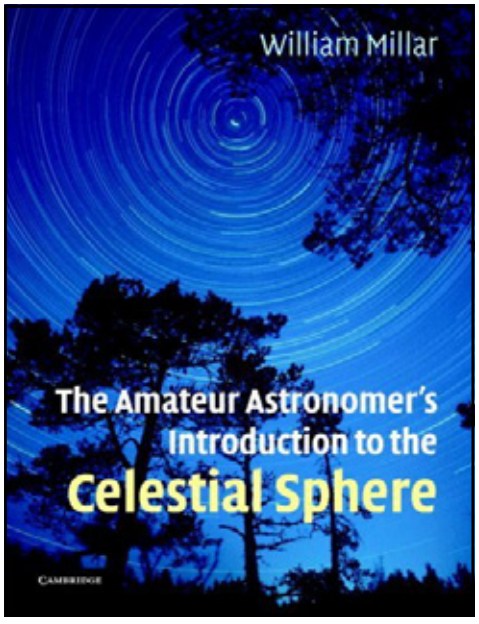

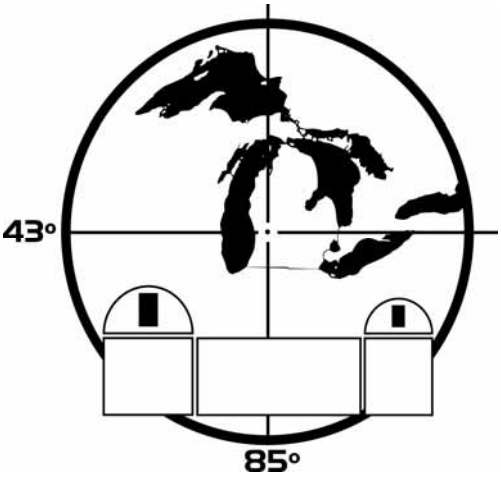

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A Publication of the
Grand Rapids Amateur
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Calendar of Events & News Notes
Happenings in the GRAAA and the astronomical community

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This is the article for you

The Few, The Proud… ……..by G.M. Ross
Defending your observations to the computer crowd who would rather play
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The wonders of the world of science and technology, brought to you by
the Jet Propulsion Laboratory

Planetarium Show Listings
Current programs at the Roger B. Chaffee Planetarium

"The Amateur Astronomer's Introduction to the Celestial Sphere"
Will Millar's first book is soon to be in your local bookstores

Note: *Any views and opinions expressed by the authors in this publication are not necessarily those of the GRAAA or its members.*

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Solar Eclipse photo courtesy Tammy Haynes
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The *Inside Orbit*

The "Orbital Period" is increasing

We face change all our lives. From the moment we are born, we change. Some for the good, some for the bad. But change we do, simply because it's inevitable.

And so the *Inside Orbit* is changing, and this time – we believe – is for the better. Starting with this issue, the *Inside Orbit* is going to be published on a monthly basis, instead of quarterly.

Why make this change, after over 40 years? Well, one of the reasons is technology. Since we're sending out the *Orbit* electronically, it can be timelier in its news and features. A problem with publishing only four times a year is that some of the information can be forgotten, out-of-date, etc. Just like the monthly magazines (*Sky & Telescope, Astronomy*, etc) have such a long lead time, and their "news" is old news by a few months.

Another reason is ease of publication. The "staff", so to speak, of the *Inside Orbit* and newsletter is small… very small. And although it seems very fluid to the vast majority of the readership, behind the scenes it gets very hectic. No doubt you have seen in every monthly newsletter the plea for articles for the upcoming *Inside Orbit*. Many times that falls on deaf ears. Why? Don't be shy. Go ahead and pen an article, a book review, a movie critique. A few issues ago we started the *"Beginning the Adventure"* series, hoping to hear from many club members. And they have been very interesting reads.

But it's hard to plead and beg for articles every three months. And if there are no articles? Then there is no *Inside Orbit* for that month. The publication date gets pushed back.

But now, with a monthly publication, we will be using what we have, and what comes in from authors. If there is a month when there are no articles submitted, the *Orbit* won't be that big. So one month you might get a six page publication, and the next month twenty.

But each issue will have the "regular" features of the quarterly edition:

- ☆ News Notes and Events – this will be expanded to give you the most news possible by publication time
- ☆ NASA's Space Place – this is a free service from NASA and JPL, and will be included each month.
- ☆ The Solar System – Instead of trying to get information for three months, we will have a more intense monthly version.
- ☆ Planetarium Shows – We'll still publish those, as a courtesy to the Chaffee Planetarium.

And if we have them, articles from you, our readers.

So hence the changes. We will welcome feedback. Tell us what you think. It is hoped that you will enjoy this monthly *Inside Orbit*, and hopefully become more involved in the club because of it.

The Publications Committee

Kevin Jung
Jeff Kozarski
Will Millar

News and Events

(Latest News and Events always online at www.graaa.org)

THE GENERAL MEETING OF THE GRAAA will be held on **Saturday, July 15th** at the James C. Veen Observatory, beginning at 6:00pm. This is the annual **"Star-B-Que".**

Famed in song and stories (you'll have to ask about all the stories, and the songs were provided in the past by Jim Foerch of "Blue Water Ramblers"), the "Star-B-Que" is our annual good-times get-together. The GRAAA Board of Directors (and our Program Chairman) hope that everyone can attend to participate in the fun. Here are the particulars:

- ☆ **When:** Saturday, July 15, 2006
- ☆ **Where:** James C. Veen Observatory
- ☆ **Time:** 6:00 pm until ??? (Lighting of the grills will begin at 6:30, and there is no ending time).
- ☆ **Moon:** Will not interfere, rises after midnight.

The club will provide the grills and the drinks, but individuals must provide the following:

- ☆ A dish to pass
- ☆ Whatever you would like to put on the grill for yourself
- ☆ Table settings (plates, napkins, utensils, condiments, etc)
- ☆ Furniture (most people sit outside) -- bring your own lawn chairs, folding tables, etc.

If you have any questions, or would like to help out in any way, please direct them to the website's email, and it will get to the people in charge of the event. Hope to see you all there!

Please note: This event/meeting is for GRAAA members, families, and invited guests only. Not open to the Public.

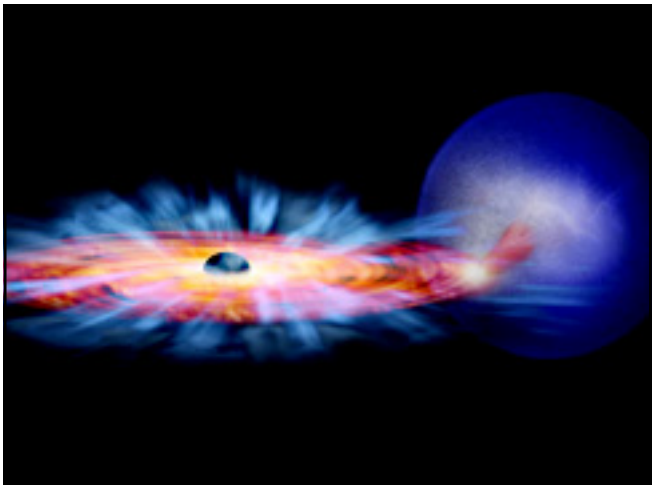
VISITORS' NIGHTS IN JULY are the 8th and 29th of the month. We will be sending out reminders the week of open nights. Please assist us if you can. Thanks to all of those members who have helped previously.

THE OBSERVATORY DOMES have been painted, thanks to the hard work of a few: Dave DeBruyn, Jim Foerch (and his son John) and Gary Ross. They now gleam brilliant white in the sun. Soon it will be time to paint the rest of the building (see news note on the next page).

THE OBSERVATORY NEEDS PAINTING. There is going to be a painting work get-together on July 22nd, and the Observatory Committee is looking for members would like to help out (the more the merrier, and easier). There will be a cookout afterwards for those who have helped. Please contact Ron Vander Werff by the 12th of July if you are able to help. This is a great time for new and old members to get together to help the observatory, and to have some fun. His phone number is 616.304.2726 and his email address is observatory.committee@gmail.com.

THERE ARE SOME MISSING ISSUES of Sky & Telescope that wee need to get our hands on to make the observatory library collection complete. If you have copies of the following issues, and would like to donate them, it would be appreciated: January 2003, April 2003, June 2003, July 2003. Please contact Dave DeBruyn if you can help out. His phone is 456-3525 and his email is ddebruyn@ci.grand-rapids.mi.us.

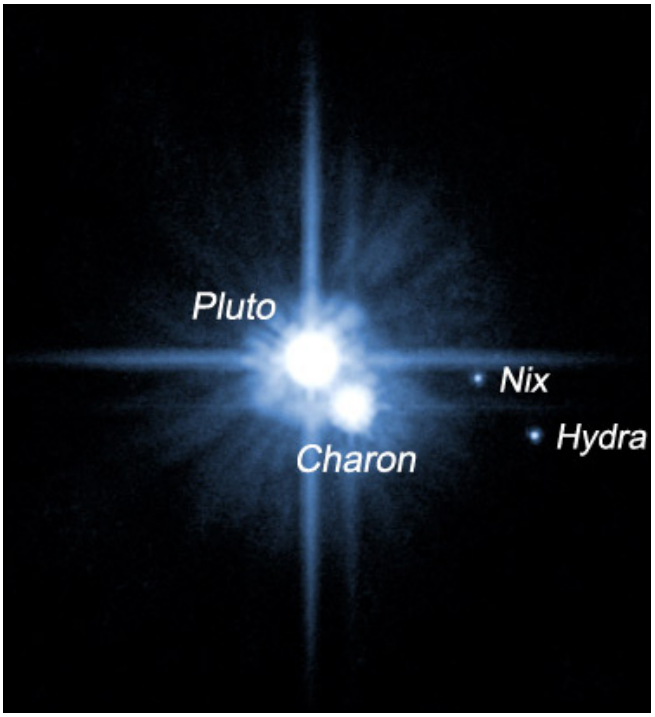
BLACK HOLE PARADOX SOLVED BY NASA'S CHANDRA: Black holes are lighting up the Universe, and now astronomers may finally know how. New data from NASA's Chandra X-ray Observatory show for the first time that powerful magnetic fields are the key to these brilliant and startling light shows.



It is estimated that up to a quarter of the total radiation in the Universe emitted since the Big Bang comes from material falling towards supermassive black holes, including those powering quasars, the brightest known objects. For decades, scientists have struggled to understand how black holes, the darkest objects in the Universe, can be responsible for such prodigious amounts of radiation.

New X-ray data from Chandra give the first clear explanation for what drives this process: magnetic fields. Chandra observed a black hole system in our galaxy, known as GRO J1655-40 (J1655, for short), where a black hole was pulling material from a companion star into a disk.

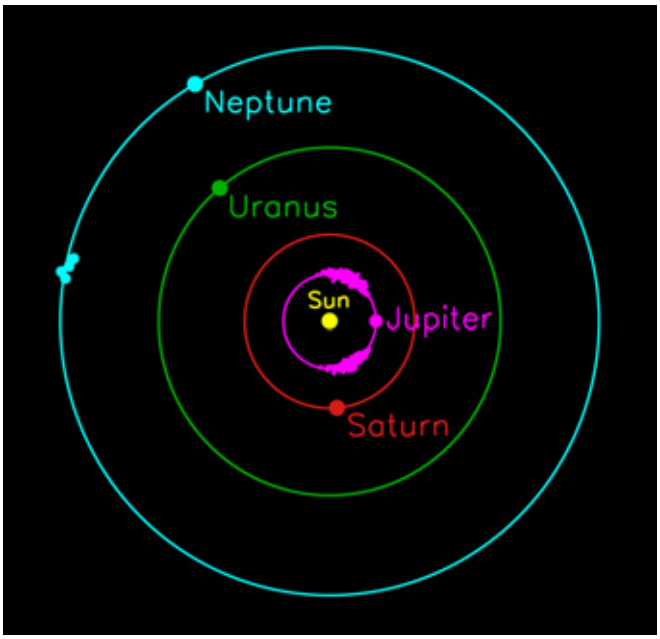
PLUTO'S TWO SMALL MOONS CHRISTENED NIX AND HYDRA: The names Nix and Hydra have been approved for the two small satellites of Pluto discovered in May 2005. The International Astronomical Union (IAU), the internationally recognized authority for assigning designations to celestial bodies, approved the names this week.



A team of researchers from Southwest Research Institute (SwRI), the Johns Hopkins University Applied Physics Laboratory (APL), the Space Telescope Science Institute and Lowell Observatory used Hubble Space Telescope images to make the discovery in support of NASA's New Horizons mission to Pluto and the Kuiper Belt beyond.

THREE NEW "TROJAN" ASTEROIDS FOUND SHARING NEPTUNE'S ORBIT: Three new objects locked into

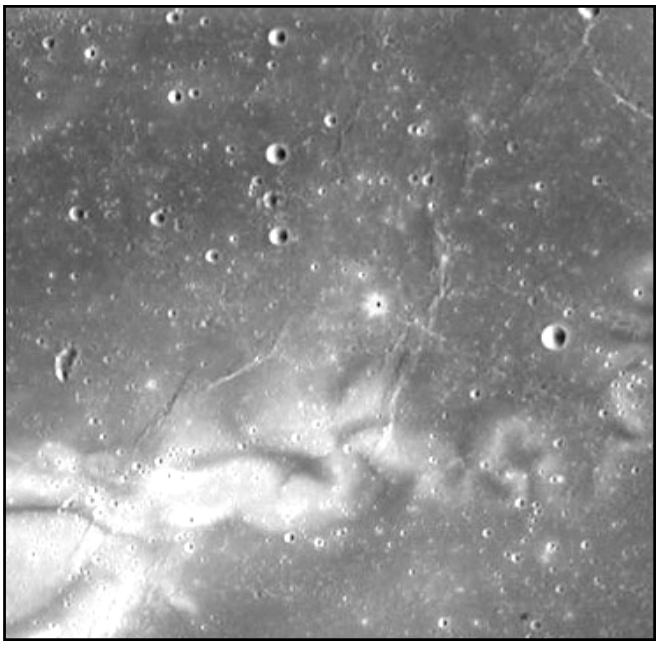
roughly the same orbit as Neptune—called "Trojan" asteroids—have been found by researchers from the Carnegie Institution's Department of Terrestrial Magnetism (DTM) and the Gemini Observatory. The discovery offers evidence that Neptune, much like its big cousin Jupiter, hosts thick clouds of Trojans in its orbit, and that these asteroids probably share a common source. It also brings the total of known Neptune Trojans to four.



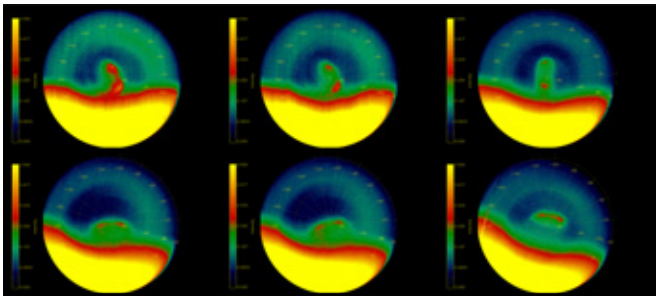
"It is exciting to have quadrupled the known population of Neptune Trojans," said Carnegie Hubble Fellow Scott Sheppard, lead author of the study, which appears in the June 15 online issue of *Science Express. "In the process, we have learned a lot both about how these asteroids become locked into their stable orbits, as well as what they might be made of, which makes the discovery especially rewarding."*

PICTURE THIS: A CUP OF COFFEE, steaming and black. Add a dollop of milk and gently stir. Eddies of cream go swirling around the cup. Magnify that image a million times and you've got a Lunar Swirl.

Lunar swirls are strange markings on the Moon that resemble the cream in your coffee—on a much larger scale. They seem to be curly-cues of pale moondust, twisting and turning across the lunar surface for dozens of miles. Each swirl is utterly flat and protected by a magnetic field.



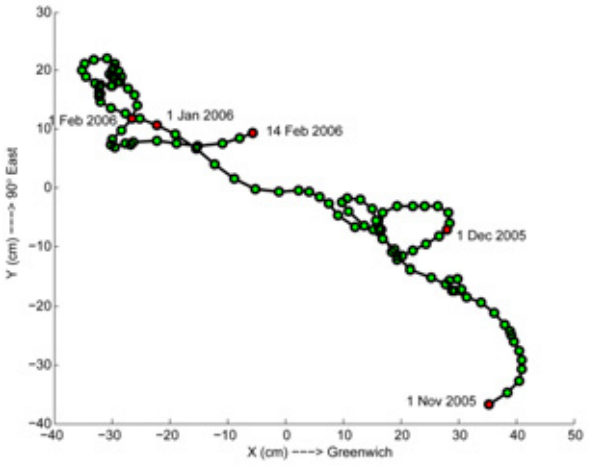
DOUBLE VORTEX AT VENUS SOUTH POLE UNVEILED! ESA's Venus Express data undoubtedly confirm for the first time the presence of a huge 'double-eye' atmospheric vortex at the planet's south pole. This striking result comes from analysis of the data gathered by the spacecraft during the first orbit around the planet.



Infrared views of south polar double-vortex

On 11 April this year, Venus Express was captured into a first elongated orbit around Venus, which lasted 9 days, and ranged between 350 000 and 400 kilometres from Venus' surface. This orbit represented for the Venus Express scientists a unique opportunity to observe the planet from large distances. This made it possible to obtain first clues about the Venusian atmospheric dynamics on a global scale, before the spacecraft got closer and started observing the planet in greater detail.

TRACKING EARTH'S WOBBLES DOWN TO THE SIZE OF A CELL PHONE: New technologies are enabling scientists to determine precisely the extent and causes of Earth's short-term wobbling. Like a spinning top, Earth wobbles as it rotates on its axis. In fact, it displays many different wobbling motions, ranging in period from a few minutes to billions of years. Some of these are well studied, like the Chandler wobble of 433 days and the annual wobble, which together can tilt Earth's axis up to 10 meters [30 feet] from its nominal center.

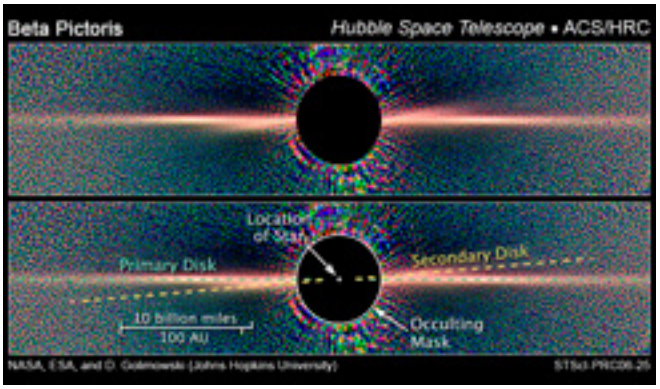


Motion of the North Pole, as determined by the IERS Earth Orientation Parameter Center of the Paris Observatory, for the study period, 1 November 2005 to 14 February 2006. Each marker represents the position of the pole on one day. Five loops are identified. Never before have these small polar movements been traced with such precision.

Earth's irregular, shorter term wobbles, lasting a week or so, have been more difficult to study, partly because these motions are usually masked by those of more prominent wobbles. Now, scientists in Belgium and France have taken advantage of a quirk in the pattern of large-scale motions and the advent of the Global Positioning System (GPS) to pin down short-term wobbles that occurred from November 2005 through February 2006.

HUBBLE REVEALS TWO DUST DISKS AROUND NEARBY STAR BETA PICTORIS: Detailed images of the nearby star Beta Pictoris, taken by NASA's *Hubble Space Telescope*, confirm the existence of not one but two dust disks encircling the star. The images offer tantalizing new evidence for at least one Jupiter-size planet orbiting Beta Pictoris.

The finding ends a decade of speculation that an odd warp in the young star's debris disk may actually be another inclined disk. The recent Hubble Advanced Camera for Surveys view – the best visible-light image of Beta Pictoris – clearly shows a distinct secondary disk that is tilted by about 4 degrees from the main disk. The secondary disk is visible out to roughly 24 billion miles from the star, and probably extends even farther, said astronomers.



***SPITZER TELESCOPE* REVEALS JETS OF MATTER AROUND DEAD STAR:** A team of scientists, including researchers in the University of Southampton's School of Physics and Astronomy, have shown that black holes are not the only known objects in the universe to produce infrared light from beams of particles being shot into space at nearly the speed of light.

Previously, these steady 'relativistic jets' were only seen from black holes which form part of a black hole X-ray binary, a system containing a black hole orbited by a normal star which is so close that the black hole's gravity can peel off the outer part of the normal star and suck in its gas through an accretion disk or disk of matter.

DEADLINE FOR THE AUGUST ISSUE of the *Inside Orbit* is July 15th. If you are interested in writing an article, review, etc., please contact the editor via the website. Submissions would be more than appreciated. In fact, there's nearly a 100% probability that what you submit will get published.

INFORMATION SPOT: The Celestial Sphere is a coordinate system similar to Earth's latitude and longitude used to locate planets, stars, star clusters, nebulae and galaxies. The celestial sphere is centered on Earth, and it includes the celestial equator, the north and south celestial poles, and lines of right ascension and declination.

The Solar System: July 2006

By Jeff Kozarski

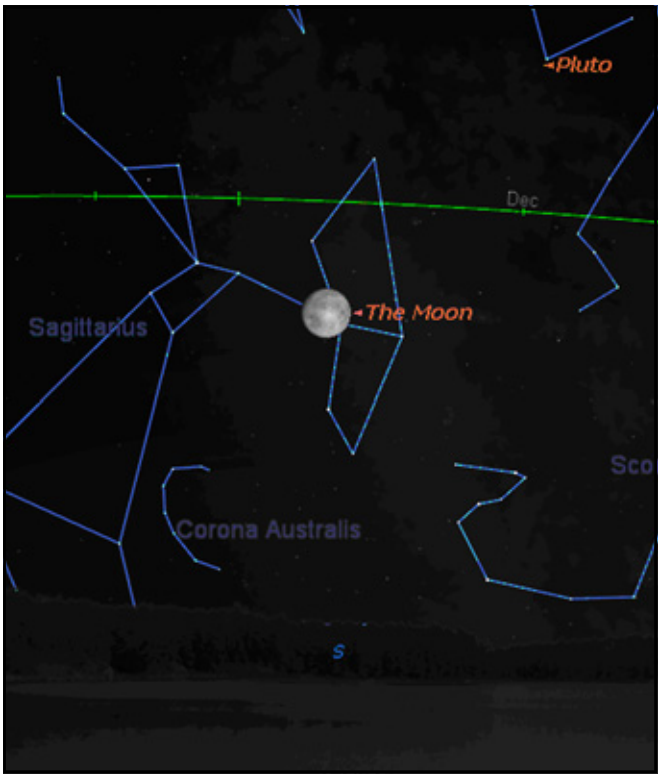
Mercury is in inferior conjunction on July 18 ending the favorable evening sky apparition of last month. By the end of July, Mercury creeps out of the predawn glare very low in the ENE sky. Next month Mercury will be reasonably favorable for viewing as it climbs a little higher each morning towards much brighter Venus above it.

On the morning of July 30th, Mercury is about 8º up, 30 minutes before sunrise.

Venus remains visible in the morning sky. At mid-month, it is rising in the ENE after 4:00 a.m. EDT about 2 hours & 15 minutes before the Sun, which places it, about 20º high at sunrise. It is currently in eastern Taurus until July 20th when it crosses into Gemini. The bright –3.9 magnitude planet sports a 11" of arc disk and is 88% lit on July 15th. A waning crescent moon is located near Venus on the mornings of July 22-23. Starting next month, Venus will slowly lose altitude in the predawn sky as it heads for superior conjunction in late October.

July 2006 Lunar Data:

☆First Quarter – July 3 at 12:36 pm. EDT.
☆Full Moon – July 10 at 11:02 pm. EDT.
☆Last Quarter – July 17 at 3:12 pm. EDT.
☆New Moon - July 25 at 12:31 am. EDT.

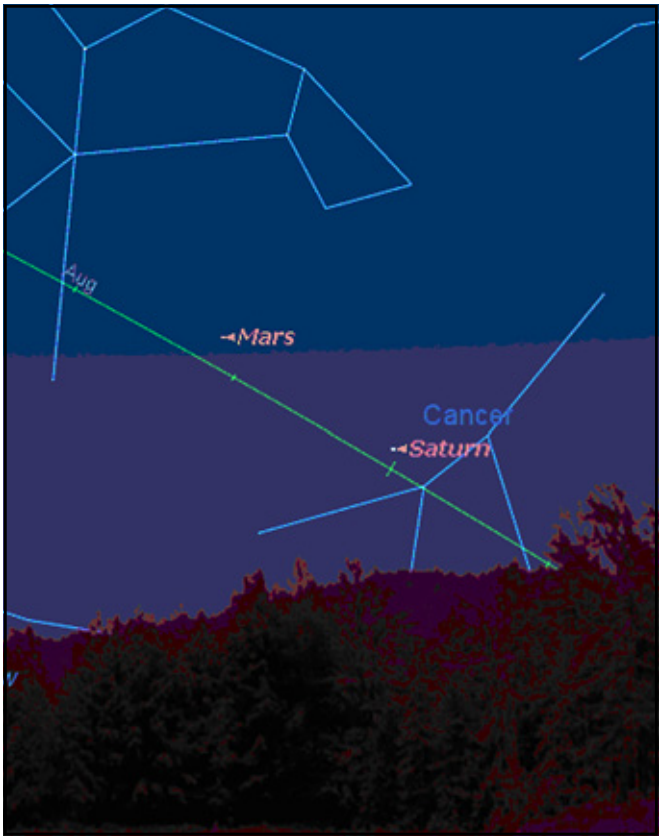


The nearly full waxing gibbous moon stays south of the ecliptic on July 10th around 1 am. EDT. With a declination of -29º, the moon's altitude is only 17º when it transits.

Earth is at aphelion (1.017 AU From Sun) on July 3rd at ~7.00pm EDT. It now slowly begins its travels back towards the sun for perihelion in January.

Mars may be glimpsed early this month in the bright evening twilight. Binoculars may be needed to spot the +1.8 magnitude planet, which should be about 10º up in the W a half-hour after

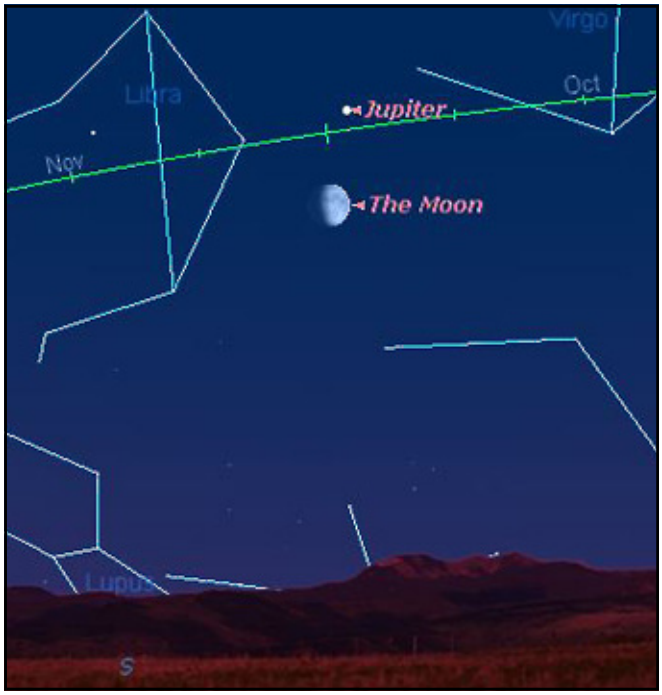
sunset. It will slowly sink into the glare of the Sun by the end of the month.



Above: Mars and Saturn low in the WNW after sunset on the Fourth of July.

Above: You may be able to glimpse Mars near the moon on the evening of July 27th.

Jupiter is still prominent in the south after sunset. It dims from –2.2 to –2.0 magnitude this month. Jupiter still spans a globe nearly 40" of arc for most of the month. It is currently in Libra near the Virgo border but will halt its retrograde motion on July 7 and will not move into Virgo.



On the evening of July 5th, Jupiter and the moon are in the south after sunset.

Saturn becomes lost in the solar glare this month. It is possible to glimpse it nearby dimmer Mars early this month. Conjunction with the Sun is early next month.

Uranus is currently in Aquarius rising in the SE around 11:30 pm. EDT. Opposition is in early September but you don't have to wait until then to find it. It is a +5.7 magnitude object with a 3.6" across disk thus very easily visible with telescopes.

Neptune rises late in the evening around 10:30 pm. EDT on July 15th. Currently in Capricornus, Neptune glows dimly at +7.8 magnitude and is 2.3" of arc across. Next month Neptune will be at opposition, though it is still an easy target for telescopes even during July.

Pluto was at opposition last month on June15 in Serpens Cauda. It is located in the SE after dark. A telescope is needed to see the +13.8 magnitude point of light.

The Few, The Proud...

or is it the other way around?

by G.M. Ross

When young, I truly admired amateur astronomers, but then I am no longer young. One of the best of them, however, is Larry F. ("the Old Man") Kalinowski, whose path I first crossed in 1959, one of the older guys, pretty old pushing twenty. I have always liked him, but at the Warren Astronomical Society meeting of 6 February 2006 I experienced a flash of hatred which several rows of auditorium seating prevented me from expressing in the most manly of ways. It all began a couple of weeks before...

At the W.A.S.'s monthly Computer Discussion Group, at the house of the munificent Gary W. ("Herr") Gathen, I make a point of discussing little about computers, being poorly equipped, but bang on about astronomical observations, largely my own. That January meeting I went on at length about my adventures beneath the (almost) southern stars including an ill-fated, nay ridiculous, attempt to see the Magellanic Clouds from Miami Beach. As a teen-ager I can be forgiven, if barely. My favourite yarn, however, was seeing Crux from south Florida, and inspired by all-you-can-eat filled dough-nuts and Pepsi-Cola, I laid it on thick(ly).

Kalinowski rose on 6 February, *supra*, to report about the Discussion Group, saying that I "claim[ed]" to have seen the Southern Cross from Florida. Gentle reader, linger a moment: I *claim* to have seen the Southern Cross. The devil you say!, my father would say. *As the second greatest observer in Michigan, I do not "claim" anything.* The Supreme Court does not "claim," or "posit" or "allege." They declare. As Sir Lancelot sings, "C'est moi!"

That out of the way, here is the story. Close your eyes and go back to another crazy, wonderful time, the first Nixon administration, the days before Janis Joplin bought it.

The wee hours of 5 February 1970 were brilliant and "brisk" on the Gold Coast of Florida. Although the readings from Fort Lauderdale to Tallahassee were not record lows -- the latter far below freezing -- it was a close thing. With the diligence that has made me celebrated from Grand Rapids to Roseville, my brother's 4.25" f/6 reflector in Mom's yellow convertible, I set out after elusive game from Hollywood-by-the-Sea. The course was due west on Hollywood Beach Blvd., Florida 820. Only very recently I learned to precision my latitude that morning thirty-six years ago, courtesy of the computer of John Francis ("Big Jack") Szymanski. I had long assumed (tsk, tsk) that downtown Miami was 26 deg. N., but no, it amazingly turns out that highway 820 was surveyed right on said parallel.

I traveled so far west that the "T" junction with U.S. 27 and the edge of the Everglades were a figurative stone's throw from the observation site. Even in 1970 this dead-flat place was not dark sky, but with the great tear-drop of the West Palm to Miami metropolitan areas describing 120 degrees of azimuth to my left, how could it be?

Not "with the greatest of ease," but there she blew, literally on the horizon, that El Dorado of southern constellations, Crux. Pardon the mixed metaphor.

The Southern Cross was not "naked eye," but the reflector brought in the whole asterism and ancillary stars nicely. One is looking at the southern-most reach of the Galactic Aequator, where that great circle touches the ground in the sub-tropics. Seeing was murder, the stars impossible to focus, looking not so much at a boil as made of gelatin. For the first time in the 1970s I saw that legendary constellation, upright as a crucifix should be.

23 February 2006 and another Discussion Group at Gathenhaus. One can learn so much from books, sometimes more than the information therein. One can learn caution. Before launching into a denunciation of Larry F. Kalinowski -- who had the cheek not to be present -- I repaired to Herr Gathen's heavily stocked astronomy library and withdrew THE CONSTELLATIONS -- AN ENTHUSIAST'S GUIDE..., by Lloyd Motz and Carol Nathanson, a fine survey. They point out, interestingly enough, that the Southern

(Continued on page 15)

A Mediterranean Cruise to Totality...

March 22 to April 3, 2006

by Thomas L. Haynes, MD

The title of this report is the title that Travelquest International gave to this tour, which was co-sponsored by Sky and Telescope Magazine.

Embarking from Genova, Italy, my wife, Tammy, and I boarded the MSC cruise ship Sinfonia with about 1500 other passengers, all going to see the great eclipse of 2006. About 1000 of us were with Travelquest with about 20 countries represented, and the rest were from Italy on another organized tour. On the second day we docked in Naples, where several of us took a tour that visited a fascinating factory where cameos are made from seashells and coral, and then on to see the city of Pompeii. I expected to see the streets littered with the casts of the citizens who had been overcome by the ash and gas from Vesuvius on that fateful day in 79 AD, but this was not so. We saw two casts in glass cases in one of the buildings on the guided tour. Nevertheless, we got a great look at what life was like in the Roman Empire in Italy at that time. The next day we were at Syracuse on the island of Sicily. After the next two nights at sea, we docked in Cairo and took a two-hour bus ride to Alexandria to see the Great Pyramids and the Sphinx. We also had a wonderful buffet lunch at a local hotel, and saw the Tutankhamen Exhibit at the Egyptian Museum of Antiquities. Fascinating! And our Egyptian guide, who was with us through the entire tour, was extremely knowledgeable and well-spoken. The only downside of this day was being taken for a ride, literally and figuratively, by the huckster camel jockeys at the Pyramids.

Then it was on to Tobruk, Libya, where we docked on the 28th and prepared for the eclipse the following day. All during this cruise the staff and guests of Sky and Telescope Magazine gave lectures and discussions about the eclipse and other topics of interest in astronomy. I was most fascinated with the talks by Dr. Ed Krupp of the Griffith Observatory who spoke on his favorite topic, archaeoastronomy, focusing on the Nile Valley and the Roman Empire. I also very much

appreciated the talk by Dr. Alan Dyer on how to photograph and image the eclipse. I learned a lot from him, but as it turns out not enough to have the success that I wanted.

On the morning of the 29th, Eclipse Day, we took buses to our viewing site, about two hours into the desert. For most of the trip there we were shrouded in fog, but just before we arrived, the fog cleared to reveal a completely clear blue sky. At our site we had no clouds, 360 degrees of clear horizon, temperature in the low 70's and a light breeze. It couldn't have been more perfect. One of the most wonderful aspects of this visit was the welcome that we received from the Libyans. They were most hospitable and friendly, with many of them able to speak English. There was none of the money-hungry hustle that we experienced from the Egyptians around the Pyramids. We were treated to native dancing, and attention from a local troop of Boy Scouts that were there. Our site had over 1000 astronomers and their friends and families. The only thing that was not well planned was the availability of toilets. After the buses unloaded a line quickly formed that eventually became at least a quarter mile long. Many walked off into the desert to do their thing.

Then it started to happen: First Contact. Over the next about 80 minutes anticipation and excitement mounted as the moon slowly shrouded the sun. I was taking an image with my Canon Digital Rebel XT camera every 20 seconds through computer control, hoping to make them into a video. It started to noticeably darken during the half-hour before totality. People were doing all sorts of neat things in this strange light with filters, projections and pinholes. Then came Second Contact, with its Bailey's Beads, Shadow Bands and Diamond Ring. Finally, TOTALITY! The corona was spectacular with several streamers. Venus was easily visible to the west. The darkness was eerie, and the horizon had a band of light around its entire circle. And I can't even begin to describe the sounds of excitement, glee and wonder that came from all those people. Cameras were going off all over. I was desperately trying to get some photos by bracketing exposures. But I was thwarted by not being able to see the camera window that told me what my settings were. Only a couple of days later did I discover how I could have done this easily by continuing to control the camera with the computer. So, my images of totality were much less than I had hoped. Oh, well. There's always another eclipse to travel to the ends of the earth to see. Tammy actually got better pictures of totality than I did, using her hand-held Canon point-and-shoot Powershot S2 IS camera.

We who saw the eclipse from this site enjoyed four minutes of totality. This was really a great amount of time to enjoy this wondrous and rare event. Then third contact happened, and the Diamond Ring reappeared on the other side of the sun than it had been at second contact. In reverse order we saw the same sequence that led to totality. People started to show each other their images of totality, and then most started to take down their equipment. We left just after fourth contact to go back to the Sinfonia. What a day!! It had all been worth it to have such a wonderful experience, and to share it with so many other people in a strange land that most of us had never imagined we would visit. One can really understand why there is a group of astronomers who go to such trouble and expense to be "eclipse chasers".

Our cruise then went to Tripoli, Malta, and Salerno, Italy. Then on the 3rd of April, we docked at Genova and disembarked.

We will go again! Who wants to join us?

*Note: These articles are courtesy **NASA Space Place Program** at the Jet Propulsion Laboratory.*

Planets in Strange Places

by Trudy E. Bell

Red star, blue star, big star, small star—planets may form around virtually any type or size of star throughout the universe, not just around mid-sized middle-aged yellow stars like the Sun. That's the surprising implication of two recent discoveries from the 0.85-meter-diameter Spitzer Space Telescope, which is exploring the universe from orbit at infrared (heat) wavelengths blocked by the Earth's atmosphere.

At one extreme are two blazing, blue "hypergiant" stars 180,000 light-years away in the Large Magellanic Cloud, one of the two companion galaxies to our Milky Way. The stars, called R 66 and R 126, are respectively 30 and 70 times the mass of the Sun, "about as massive as stars can get," said Joel Kastner, professor of imaging science at the Rochester Institute of Technology in New York. R 126 is so luminous that if it were placed 10 parsecs (32.6 light-years) away—a distance at which the Sun would be one of the dimmest stars visible in the sky—the hypergiant would be as bright as the full moon, "definitely a daytime object," Kastner remarked.

Such hot stars have fierce solar winds, so Kastner and his team are mystified why any dust in the neighborhood hasn't long since been blown away. But there it is: an unmistakable spectral signature that both hypergiants are surrounded by mammoth disks of what might be planet-forming dust and even sand.

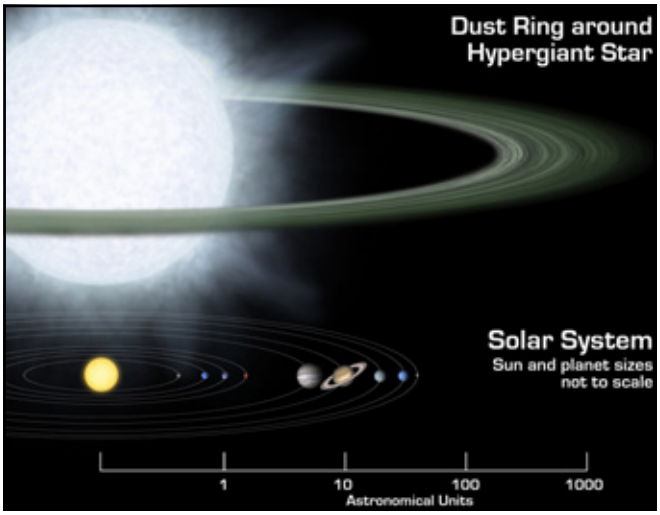
At the other extreme is a tiny brown dwarf star called Cha 110913-773444, relatively nearby (500 light-years) in the Milky Way. One of the smallest brown dwarfs known, it has less than 1 percent the mass of the Sun. It's not even massive enough to kindle thermonuclear reactions for fusing hydrogen into helium. Yet this miniature "failed star," as brown dwarfs are often called, is also surrounded by a flat disk of dust that may eventually clump into planets. (Note: This brown dwarf discovery was made by a group led by Kevin Luhman of Pennsylvania State University.)

Although actual planets have not been detected (in part because of the stars' great distances), the spectra of the hypergiants show that their dust is composed of forsterite, olivine, aromatic hydrocarbons, and other geological substances found on Earth.

These newfound disks represent "extremes of the environments in which planets might form," Kastner said. "Not what you'd expect if you think our solar system is the rule."

Hypergiants and dwarfs? The Milky Way could be crowded with worlds circling every kind of star imaginable—very strange, indeed.

Keep up with the latest findings from the Spitzer at www.spitzer.caltech.edu/. For kids, the Infrared Photo Album at The Space Place (spaceplace.nasa.gov/en/kids/sirtf1/sirtf_action.shtml) introduces the electromagnetic spectrum and compares the appearance of common scenes in visible versus infrared light.



Artist's rendering compares size of a hypothetical hypergiant star and its surrounding dusty disk to that of our solar system.

Who Wants to be a Daredevil?

by Patrick L. Barry and Dr. Tony Phillips

When exploring space, NASA naturally wants to use all the newest and coolest technologies—artificial intelligence, solar sails, onboard supercomputers, exotic materials.

But "new" also means unproven and risky, and that could be a problem. Remember HAL in the movie "2001: A Space Odyssey"? The rebellious computer clearly needed some pre-flight testing.

Testing advanced technologies in space is the mission of the New Millennium Program (NMP), created by NASA's Science Mission Directorate in 1995 and run by JPL. Like the daredevil test pilots of the 1950s who would fly the latest jet technology, NMP flies new technologies in space to see if they're ready for prime time. That way, future missions can use the technologies with much less risk.

Example: In 1999, the program's Deep Space 1 probe tested a system called "AutoNav," short for Autonomous Navigation. AutoNav used artificial intelligence to steer the spacecraft without human intervention. It worked so well that elements of AutoNav were installed on a real mission, Deep Impact, which famously blasted a crater in Comet Tempel 1 on July 4, 2005. Without AutoNav, the projectile would have completely missed the comet.

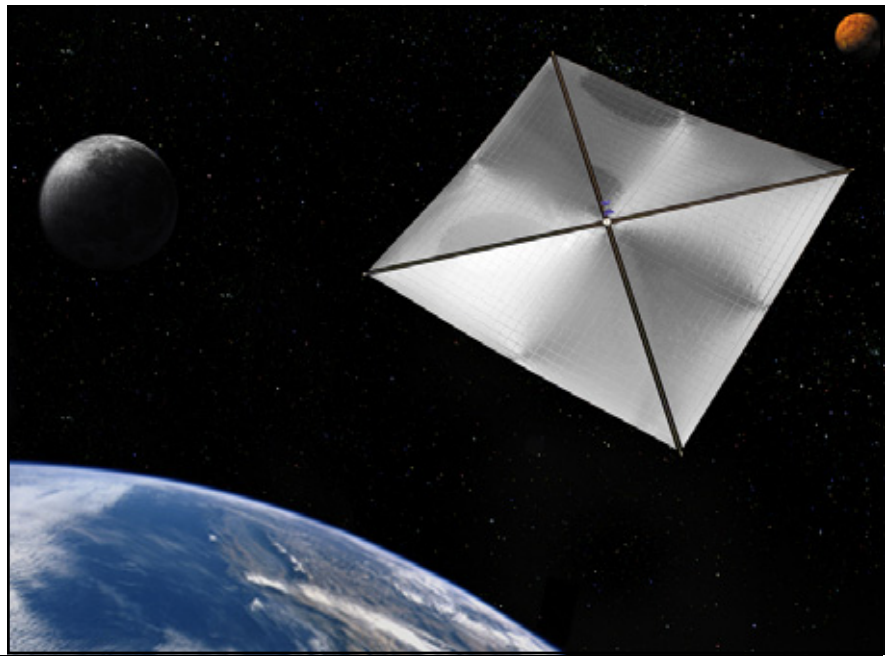
Some NMP technologies "allow us to do things that we literally could not do before," says Jack Stocky, Chief Technologist for NMP. Dozens of innovative technologies tested by NMP will lead to satellites and space probes that are smaller, lighter, more capable and even cheaper than those of today.

Another example: An NMP test mission called Space Technology 9, which is still in the planning phase, may test-fly a solar sail. Solar sails use the slight pressure of sunlight itself, instead of heavy fuels, to propel a spacecraft. Two proposed NASA missions would be possible only with dependable solar sails—L1 Diamond and Solar Polar Imager—both of which would use solar sails to fly spacecraft that would study the Sun.

"The technologies that we validate have future missions that need them," Stocky says. "We try to target [missions] that are about 15 to 20 years out."

A menagerie of other cool NMP technologies include ion thrusters, hyperspectral imagers, and miniaturized electronics for spacecraft navigation and control. NMP focuses on technologies that have been proven in the laboratory but must be tested in the extreme cold, vacuum, and high radiation environment of space, which can't be fully recreated in the lab.

New NMP missions fly every year and one-half to two years, taking tomorrow's space technology for a daredevil test drive.



Artist's rendering of a four-quadrant solar sail propulsion system, with payload. NASA is designing and developing such concepts, a sub-scale model of which may be tested on a future NMP mission.

Not a Moment Wasted

by Dr. Tony Phillips

The Ring Nebula. Check. M13. Check. Next up: The Whirlpool galaxy.

You punch in the coordinates and your telescope takes off, slewing across the sky. You tap your feet and stare at the stars. These Messier marathons would go much faster if the telescope didn't take so long to slew. What a waste of time!

Don't tell that to the x-ray astronomers.

"We're putting our slew time to good use," explains Norbert Schartel, project scientist for the European Space Agency's XMM-Newton x-ray telescope. The telescope, named for Sir Isaac Newton, was launched into Earth orbit in 1999. It's now midway through an 11-year mission to study black holes, neutron stars, active galaxies and other violent denizens of the Universe that show up particularly well at x-ray wavelengths.

For the past four years, whenever XMM-Newton slewed from one object to another, astronomers kept the telescope's cameras running, recording whatever might drift through the field of view. The result is a stunning survey of the heavens covering 15% of the entire sky.

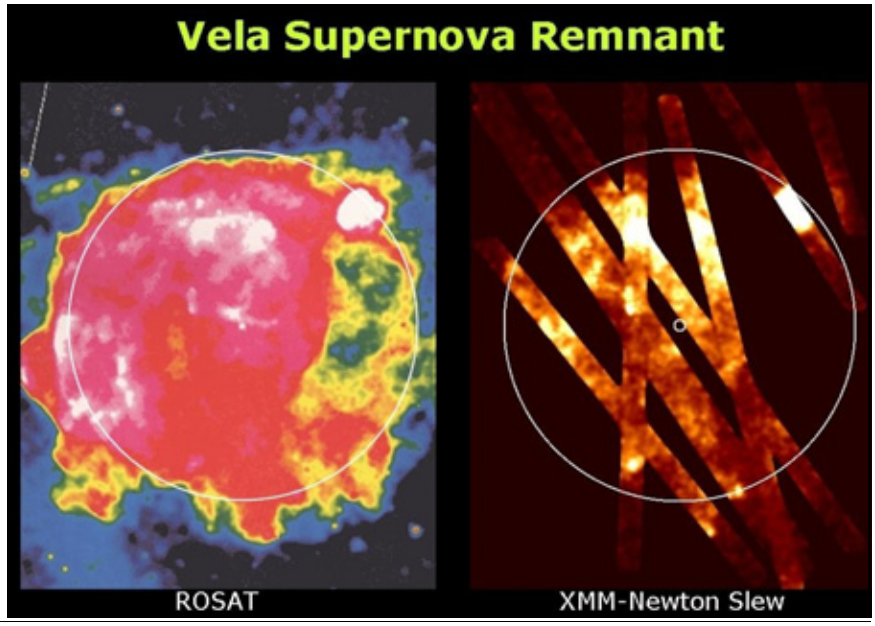
Sifting through the data, ESA astronomers have found entire clusters of galaxies unknown before anyone started paying attention to "slew time." Some already-known galaxies have been caught in the act of flaring—a sign, researchers believe, of a central black hole gobbling matter from nearby stars and interstellar clouds. Here in our own galaxy, the 20,000 year old Vela supernova remnant has been expanding. XMM-Newton has slewed across it many times, tracing its changing contours in exquisite detail.

The slew technique works because of XMM-Newton's great sensitivity. It has more collecting area than any other x-ray telescope in the history of astronomy. Sources flit through the field of view in only 10 seconds, but that's plenty of time in most cases to gather valuable data.

The work is just beginning. Astronomers plan to continue the slew survey, eventually mapping as much as 80% of the entire sky. No one knows how many new clusters will be found or how many black holes might be caught gobbling their neighbors. One thing's for sure: "There will be new discoveries," says Schartel.

Tap, tap, tap. The next time you're in the backyard with your telescope, and it takes off for the Whirlpool galaxy, don't just stand there. Try to keep up with the moving eyepiece. Look, you never know what might drift by.

See some of the other XMM-Newton images at http://sci.esa.int . For more about XMM-Newton's Education and Public Outreach program, including downloadable classroom materials, go to http://xmm.sonoma.edu. Kids can learn about black holes and play "Black Hole Rescue" at The Space Place, http://spaceplace.nasa.gov/, under "Games."



The image on the left is the Vela Supernova Remnant as imaged in X-rays by ROSAT. On the right are some of the slew images obtained by XMM-Newton in its "spare" time.

From Thunderstorms to Solar Storms…

by Patrick L. Barry

When severe weather occurs, there's a world of difference for people on the ground between a storm that's overhead and one that's several kilometers away. Yet current geostationary weather satellites can be as much as 3 km off in pinpointing the true locations of storms.

A new generation of weather satellites will boost this accuracy by 2 to 4 times. The first in this new installment of NOAA's Geostationary Operational Environmental Satellites series, called GOES-N, was launched May 24 by NASA and Boeing for NOAA (National Oceanic and Atmospheric Administration). (A new polar-orbiting weather satellite, NOAA-18, was launched May 2005.)

Along with better accuracy at pinpointing storms, GOES-N sports a raft of improvements that will enhance our ability to monitor the weather—both normal, atmospheric weather and "space weather."

"Satellites eventually wear out or get low on fuel, so we've got to launch new weather satellites every few years if we want to keep up the continuous eye on weather that NOAA has maintained for more than 30 years now," says Thomas Wrublewski, liaison officer for NOAA at NASA's Goddard Space Flight Center.

Currently, GOES-N is in a "parking" orbit at 90° west longitude over the equator. For the next 6 months it will remain there while NASA thoroughly tests all its systems. If all goes well, it will someday replace one of the two active GOES satellites—either the eastern satellite (75°W) or the western one (135°W), depending on the condition of those satellites at the time.

Unlike all previous GOES satellites, GOES-N carries star trackers aboard to precisely determine its orientation in space. Also for the first time, the storm-tracking instruments have been mounted to an "optical bench," which is a very stable platform that resists thermal warping. These two improvements will let scientists say with 2 to 4 times greater accuracy exactly where storms are located.

Also, X-ray images of the Sun taken by GOES-N will be about twice as sharp as before. The new Solar X-ray Imager (SXI) will also automatically identify solar flares as they happen, instead of waiting for a scientist on the ground to analyze the images. Flares affect space weather, triggering geomagnetic storms that can damage communications satellites and even knock out city power grids. The improved imaging and detection of solar flares by GOES-N will allow for earlier warnings.

So for thunderstorms and solar storms alike, GOES-N will be an even sharper eye in the sky.

Find out more about GOES-N at goespoes.gsfc.nasa.gov/goes. Also, for young people, the SciJinks Weather Laboratory at scijinks.nasa.gov now includes a printable booklet titled "How Do You Make a Weather Satellite?" Just click on Technology.

New GOES-N satellite launches, carrying an imaging radiometer, an atmospheric sounder, and a collection of other space environment monitoring instruments.

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SHOWTIMES: Daily at 2:30 pm.

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Added Value: This show is free with paid Museum admission; or arrive after 3:00pm for the planetarium show only and pay only $3.00/person.

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SHOWTIMES: at 1:30 pm.

Note: Planetarium sky theater closed for maintenance Sept. 5-22, 2006

The Few, The Proud...
(Continued from page 8)

Cross was above the horizon at Jerusalem in Jesus' time. On the other hand, Error lurks. The authors opine that the constellation presently cannot be seen north of twenty-five degrees, and to be fair, they are sort of right. The whole asterism cannot be seen with the *naked eye* but, with an even more modest telescope than my brother's, Crux can most certainly be.

From SKY ATLAS 2000 the possibility can be seen by inspection. Acrux, a B1 firebox of magnitude 1.6, the bottom star, is at declination -62 deg. 49'. Also observable in the telescope, its 5.1, Class B5 immediate neighbour is at -62 deg. 51'. (SMITHSONIAN OBSERVATORY STAR CATALOGUE, in the Veen library.) As Americans currently say, "Do the math." Mark John ("Merk") Christensen would say, "Not 'math.' Arithmetic."

Rounding off a little. 62 deg. 50 minutes from 90 degrees = 27 deg. 10 min., how far north one can still be to place Acrux precisely on the southern horizon at upper culmination. However, there is the bonus of atmospheric refraction, that half-degree of lift which allows us to see the sunrise/set when actually the globe is *below* the horizon. During the morning of 5 February 1970, with transparency which must have exceeded Standard Clear, all conditions were right: constellation position, a little bit of boost from the refraction allowing a peek over the horizon, and some light gathering power from a small telescope.

Q.E.D. Per the immortal astrophotographer from Ft. Lauderdale and Ft. Wayne, Matt F. Taggart, "All you have to do is get up in the morning."

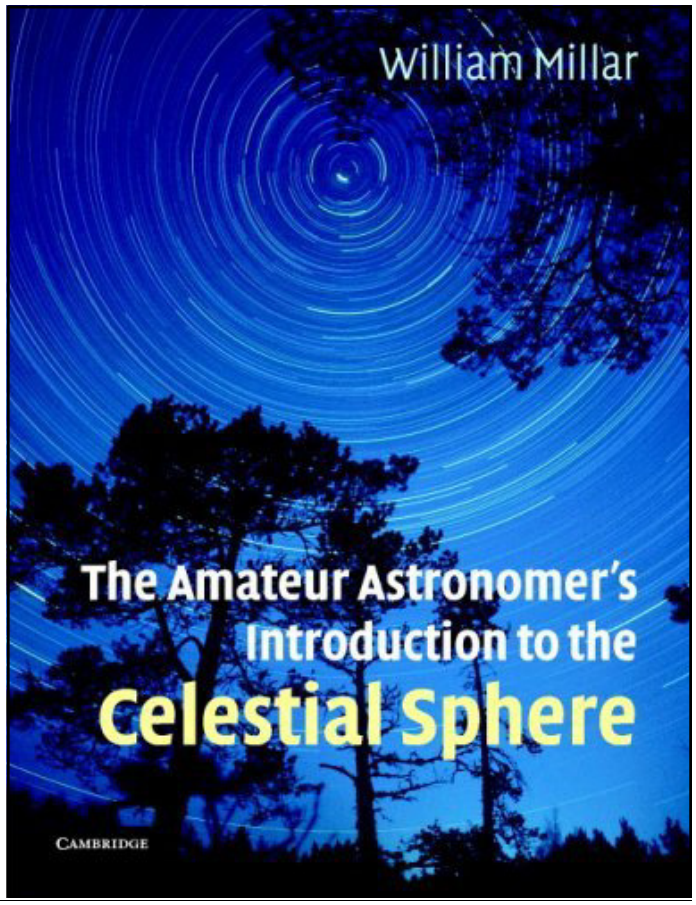
EPILOGUE: In the August, 1966 SKY AND TELESCOPE, Jose Olivarez of Mission, Texas reported that from +26 deg 10': "Crux can be seen after an afternoon thunderstorm has left clear skies down to the horizon. This May I went out of town to a site with a perfectly flat horizon, and was able to view the lowest of the four stars (Alpha) as a faint glimmer, which binoculars confirmed."

The Amateur Astronomer's Introduction to the Celestial Sphere

Announcing a new book by GRAAA member Will Millar

In July 2006, Cambridge University Press will publish the first book of a series authored by GRAAA member and Grand Rapids Community College Professor Will Millar. This first book, **"The Amateur Astronomer's Introduction to the Celestial Sphere,"** is a basic introduction to the night sky. Here is the synopsis from Cambridge's website...

> This introduction to the night sky is for amateur astronomers who desire a deeper understanding of the principles and observations of naked-eye astronomy. It covers topics such as terrestrial and astronomical coordinate systems, stars and constellations, the relative motions of the sky, sun, moon and earth leading to an understanding of the seasons, phases of the moon, and eclipses. Topics are discussed and compared for observers located in both the northern and southern hemispheres. Written in a conversational style, only addition and subtraction are needed to understand the basic principles and a more advanced mathematical treatment is available in the appendices. Each chapter contains a set of review questions and simple exercises to reinforce the reader's understanding of the material. The last chapter is a set of self-contained observation projects to get readers started with making observations about the concepts they have learned. William Charles Millar, currently Professor of Astronomy at Grand Rapids Community College in Michigan, has been teaching the subject for almost twenty years and is very involved with local amateur astronomy groups. Millar also belongs to The Planetary Society and the Astronomical Society of the Pacific and has traveled to Europe and South America to observe solar eclipses. Millar holds a Masters degree in Physics from Western Michigan University.



Contents

1. The lure of the sky
2. Location and coordinates
3. Stars and constellations
4. Motions of the Earth
5. The seasons
6. The phases of the Moon
7. Eclipses
8. Observation projects
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