



This image of the Andromeda Galaxy (M31) with companions M110 (near upper left) and M32 (right of center) was taken on December 28, 2002 by Bill Patterson through a Takahashi FSQ106 from Sunglow Ranch, Arizona. Visible in almost any instrument, M31 rises around 12:30 AM at the beginning of this month and is a great object to view all summer long!

OCA CLUB MEETING

The free and open club meeting will be held Friday, June 10th at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. The featured speaker this month is still to be arranged as of press time. Be sure to check the Calendar on our website (www.ocastronomers.org) for more details!

STAR PARTIES

The Black Star Canyon site will be open again on July 2nd. The Anza site will be open June 4th. Members are encouraged to check the website calendar, for the latest updates on star parties and other events.

Please check the website calendar for the outreach events this month! Volunteers are always welcome!

You are also reminded to check the web site frequently for updates to the calendar of events and other club news.

COMING UP

The next session of the Beginners Class will be held on Friday, June 3rd (and next month on July 1st) at the Centennial Heritage Museum at 3101 West Harvard Street in Santa Ana.

GOTO SIG: June 6th

Astro-Imagers SIG: June 21st, July 19th

EOA SIG: June 27th, July 25th

Astrophysics SIG: June 17th, July 15th

Dark Sky Group (new!): TBA (contact coordinator for details)

June President's Message

Welcome to the June edition of the Sirius Astronomer.

Messier Marathon:

Our May meeting brought certificates to a few patrons of the March Messier Marathon. Despite cloudy weather (which ended the night early -around midnight) we still had folks see a fair number of Mxx objects. Winners this year were Doug Millar & Helen Mahoney with 27 objects! They managed to start sometime after 10:30pm and were busy at the scope! Top honors go to Don Lynn & Suzann Hall. Starting on time, they managed to see all 74 possible objects before the clouds! They also saw these objects using a variety of telescopes from different locations at Anza. Hats off to this years participants.

I have yet to receive any images or montage of images from the marathon and I know folks took images. Please send me an email because there is an unclaimed \$50 gift certificate to the person who got the best shots that night.

Anza Notes:

Many thanks to all who have started weed duty. Last star party, some progress was made as our weed situation continues. Weeds are nearly knee high in some spots. Jupiter ridge took on the most weeds. Some of you have started clearing but many have not. Lets not forget what happened last June. We don't want an early "starbque" again.

Don Lynn and new helper Fred Green continued to make progress on our fence. Approximately 1300 feet of poles and wire are left. If you would like to help us, contact me @ Dave.Radosevich@ngc.com.

Vance Tyree & Gary Schones continue to make progress on the broadband move. The new satellite tower is secured to Anza house and conduit has started. We are still planning on the dish move within the next couple of weeks..stay tuned.

Many thanks for all the work done in May!

Anza House:

Our coordinator Tim Hunt is asking for an "Outside" cleanup of Anza House. Lots of construction debris and trash is strung about the parameter and will require a dump run. The May Star Party will yield the best time to pick up this trash! All who use Anza House are encouraged to participate! I will provide the truck and trailer for all general cleanups at Anza. If you use the Anza House and notice issues or supply shortages, please contact Timothy @ hunt_Timothy@msn.com

Pad & Observatory Licensees:

You should all be receiving letters explaining new licensee fees. Increases to our current fee structure are necessary for the upkeep and expansion of Anza. Operating costs, maintenance and growth contributed to this moderate increase. Pad & Observatory numbering will also occur this summer. A published numbered list will allow other members to directly contact you per the licensee agreements for usage. Questions? Contact me @ Dave.Radosevich@ngc.com or call (310) 813-9021.

Thanks for reading and see you at Anza and the June meeting!

Dave Radosevich
OCA President

MEMBERS ASSISTING THE LIBRARY

William and Toni Lee donated 2 books and a much-needed second copy of Cosmos on DVD for the library

Steve Short helped the library immensely by buying new hardware and fixing one of the cabinets at the last meeting

Thanks to all of you for your efforts!

AROUND OCA

By Barbara Toy

Here we are at June and the summer solstice – nights are a lot shorter but are warming up, and we're all hoping for a summer of good viewing after a winter of clouds and rain. It's true that we've had some great displays of wildflowers after our extremely wet winter, but I'm not sure that's made up for all the celestial displays we missed due to the weather.

There have been some recent events that have overtaken my original plans for this month's column, so the continuation of last month's topic will be next month, and instead I'd like to share some thoughts about one of our long-time volunteers, and tell you what's happening in some other areas.

Appreciation for Antonio Miro

As I write this, Antonio Miro has just come through a lengthy and difficult surgery, and his many friends and loved ones have been faced with the real possibility of losing him. Events like this often make us take stock and realize that we haven't given someone proper public recognition for their achievements and contributions – so I'd like to take this opportunity to tell you a bit about Antonio.

Our Beginners' Class was started by Don French, and Antonio took it over about six or seven years ago, when Don was no longer able to handle it. Over the time he has run the Beginners' Class, Antonio has developed its current structure and format, and has also written a very helpful series of outlines for different areas covered by the class (which you can download from our website). There are two cycles of the classes each year, and each class usually has from 15 to 25 students, so there are a lot of people around who learned the basics of astronomy from Antonio over the years he's taught the class – this includes how to observe and with what. A lot of people got their first introduction to the club through Antonio's classes, and later became members, though the main purpose of the classes is to help people learn the basics of our hobby and to share our interest and knowledge about what's up there with the general public, not really to recruit new members.

One of the things I admire most about Antonio's approach to the class is his willingness to incorporate new ideas to improve it – such as making the "How to Use Your Telescope" session a regular part of the class after our first experiment with it a couple years ago proved to be a tremendous success. Unlike many people who become territorial about something they've run for years, Antonio has always been very generous about letting other people participate, and about seriously considering suggestions for modifying the class and its materials. I know this from personal experience, as I've frequently discussed these with Antonio since I first went to the class well over two years ago and stayed on to help out.

Unfortunately, he hasn't been able to come to the class himself since his first surgery last fall, and, realistically, it will be several months before he is physically capable of actively participating again – and that is if he has no further complications. We miss him and look forward to having him back, but, in the meantime, Dave Pearson is doing a very good job with it. Because of his health problems, Antonio asked to be taken off of the club's contact list as the contact for the Beginners' Class, so the formal contact person now is Dave Pearson, and I'm continuing to assist.

Besides the Beginners' Class, Antonio has been a regular at outreaches over the years – that, in fact, is where I first met him – and has frequently chauffeured beginners out to Anza when they were diffident about going on their own or didn't have transportation. Many of them then learned about observing from him first hand, as they often spent a lot of their time at Anza observing with him through his home-built Dobsonian (Antonio built the drive system as well as the telescope), which increased their enthusiasm for the hobby. His health has limited all of his activities, and it's been far too long since we've heard his charming accent at outreaches or club meetings, or his distinctive drive motors down on the Football Field. Here's hoping for a speedy recovery from your surgery, and no further complications, Antonio!

The OCA-TV (Video) SIG

Over the years, the club has tried a several different arrangements for videotaping general meetings. The goal has been to have tapes available for members who missed the meetings or maybe wanted to see the talk again, as well as to have an archive of the meetings themselves. The attempts to do regular videotaping of the meetings had pretty much died by the time I joined the Board in 2001. The subject came up in Board discussions several times, but nobody had any good plan for doing continued taping until Liam Kennedy decided to add it to his many club projects. He started videotaping meetings with his own camera, and people who attended the meetings two or three years back may recall seeing Anna, Liam's wife and a frequent contributor of time, energy and expertise to the club herself, running the video camera from the back of the auditorium through many meetings.(continued next page)

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Liam gave the project an entirely new direction about two years ago when he began to develop the tapes of the meetings and other subjects of astronomical interest into the club's own television show, "Look Up Tonight With the OCA." Besides obtaining the raw material and producing the shows themselves, Liam developed the contacts with the local cable stations that allowed the program to be aired, and it was quite a success – but at a high cost in Liam's time and energy. He recruited several club members to help with the taping during the meetings and what was needed at other locations (Tom Kucharski and Jim and Brian Norman have been particularly active with this), but the bulk of the work inevitably fell on Liam's shoulders, as each TV show took days of editing.

In the meantime, Liam had started his own company, and the good news on that front is that demand for his services has been steadily growing and he is seeing some of the success he so richly deserves. The bad news for us is that he no longer has the time to produce the TV show. Even though he can no longer handle this himself, though, he's available for consultation and undoubtedly will be as willing to share his expertise in this area as in the many other areas where he has put his creativity to work for the club in the past (such as the club's website).

So, those of us in the OCA-TV SIG are working out new approaches to the video project – and this is a great time for you to get involved if you have any interest in video at all. Our immediate concern is capturing the meetings on tape – Jim and Brian Norman did a great job of handling the cameras for the May meeting, and we are hoping that there are a number of you who would be interested in helping out with that side of the project. Tom Kucharski has volunteered to do the editing of the tapes for the May meeting, and we would like to have other people who want experience in editing video – or maybe already have expertise in that area they'd like to use for the benefit of the club – get involved on the editing side, as well. We've been getting two camera angles, and also (when we can) the speaker's slides on CD, so you can bring a lot of creativity to combining all of these to produce the finished meeting videos. And, if we can get a few good videos in reserve, maybe we can re-connect with the cable companies and go back on the air with the TV show...

To join us, please contact Tom Kucharski (TomRigel@aol.com or 949/348-0230) or me (btoy@cox.net or 714/606-1825). You are also welcome to join our email group, which we use to coordinate our activities as well as for discussion of the various issues that come up with the project, ocatv@yahogroups.com.

AstroImage 2006

Somehow (I'm not quite sure why – Dave Kodama told me it was because of my "enthusiasm" and that I have "all that free time" since I'm no longer president...) I seem to be the designated person to chair the planning committee for AstroImage 2006. Well, I guess I'm enthusiastic enough to want to get things on track for our next imaging conference, as they do take a certain amount of planning. And, even though it's more than a year away, we want to make people aware that it really is set and they should start planning for it.

So, we now have the dates for AstroImage 2006 – Friday night and Saturday, August 4 and 5, 2006. Be sure to mark your calendars and plan to attend!

Another reason for bringing this up now is that this is the time for you to let us know what you would like to see happen at the conference. If you looked at the schedule of events for either of the last two AI conferences and decided not to go because you thought it was missing something – let us know what that something was! If you came to either of the last two AI conferences and felt that things could have been improved on – tell us what those things were and (if you can) what suggestions you have for improvements. If you've become aware of an imaging-related topic that you would like to see covered at the conference – tell us what it is, and any suggestions you have for a presenter on the topic. And if you have any suggestions for activities you'd like to see added to the conference, we're interested in knowing about that, too.

And, of course, if you would like to be involved in the planning of AI 2006, or would be willing to help us out with some of the many tasks that need to be done outside of the planning process itself so that everything will work right, please let me know – we'll all be delighted to welcome you aboard!

For Sale: 8" Coulter (red tube) Dobsonian. The scope is in excellent condition and has only been used a handful of times. \$260.00. Contact Richard Passmore at (714) 558-7714 or RadMD80@aol.com

For Sale: Coronado MaxScope 40, perfect condition, \$1300. Gerald Strong 714-538-2517

For Sale: Canon EOS Rebel G, Excellent condition only a few years old. Camera body only. - \$100 o.b.o., Please call Bill Johnson at 714-553-5793 or e-mail at home@byjohnson.com

ASTROSPACE UPDATE

June 2005

Gathered by Don Lynn from NASA and other sources

To find out more on these topics, or those of past months' columns, through the World Wide Web, send your Web browser to our OCA Web site (<http://www.ocastronomers.org>), select Space Update Online, and the topics are there to click on.

Star clusters – Astronomers using the Newton Telescope in the Canary Islands to study the Andromeda Galaxy have discovered a new type of star cluster. This type contains hundreds of thousands of stars, similar to globular clusters, but are larger – several hundred light years across. These clusters are distributed in a spherical halo extending about 200,000 light years. There are no similar clusters around our Milky Way galaxy. The newly found clusters are ancient, containing stars that formed early in the history of the Universe.

Short gamma-ray burst – It has been known for a few years that the spectrum and variability with time of short gamma-ray bursts (those lasting less than 2 seconds) is quite different from longer gamma-ray bursts. The afterglows in other wavelengths of light have been found for quite a number of longer gamma-ray bursts, observations of which have determined that a burst is caused by the supernova of a very massive star. But the afterglow of a short burst had never been found until May 9 when the Swift satellite detected a 1/20 second long gamma-ray burst and automatically turned its ultraviolet and X-ray telescopes to the spot within one minute and found an afterglow, but only in X-rays. The afterglow faded from visibility in about 5 minutes, which explains why we have never caught one before. The burst appears to have come from a galaxy of old stars about 2.7 billion light-years away. All the characteristics of the afterglow and its source galaxy support the theory that short gamma-ray bursts are caused by colliding and merging neutron stars or black holes, unlike long bursts. Long gamma-ray bursts often produce afterglows in many wavelengths that last for days or weeks, and occur in galaxies filled with young massive stars. Many ground-based follow up observations of the short burst have been made or will be soon, but as of this writing, no trace of the fast fading afterglow was found other than by Swift.

PAIRITEL (automated infrared telescope in Arizona) has managed to image a gamma-ray burst (long variety) in infrared while it was still bursting in gamma rays, about 7 minutes after the beginning of the burst was detected by the Integral satellite, which notified PAIRITEL. Infrared monitoring continued through the end of the burst, and afterward for afterglow, which was seen hours later. PAIRITEL was built by automating the telescope that was formerly used for the 2MASS all-sky infrared survey.

Galaxy mystery solved – Theory predicts that the dwarf galaxies surrounding our Milky Way galaxy should occupy a spherical halo about the galaxy, but observations show they occupy a flattened pancake shape, perpendicular to the Milky Way plane. There are also too few dwarf galaxies compared to theory. A new supercomputer model of galaxy formation produced the shape and number observed. The new model shows that dark matter collapses into a sheet-like structures, with galaxies then forming at the knots in the sheet. This results in dwarf galaxies forming only in the sheet of dark matter, producing the number and shape observed.

Neutron star hot spots – Astronomers using the European XMM-Newton X-ray observatory have observed for the first time hot spots rotating across the surfaces of 3 nearby neutron stars. The spots were found to vary in size from about 60 yards to 1000 yards. Theorists had predicted that electromagnetic energy should be funneled onto the surface to create such hot spots, probably at the magnetic poles. The hot spots were detected by their effect on the X-ray light of the neutron stars as the spots rotated into or out of view. It is not known why the sizes of the spots varied among different neutron stars.

Cassini (Saturn mission) made its closest flyby yet of Titan, at a distance of 638 miles, and so got some very high resolution images from its infrared and radar instruments. More features that look like stream channels were seen, supporting that liquid methane flows on the surface and erodes it. Lots of complex hydrocarbons and carbon-nitrogen compounds were detected in Titan's upper atmosphere. Titan's atmosphere was known to be composed mostly of nitrogen, followed by methane. Those components were expected to form complex hydrocarbons in the presence of sunlight and Saturn's magnetospheric particles, and this was amply confirmed.

Cassini has discovered **dust** particles around the moon Enceladus. It is not clear if they originate from the moon or from the surrounding E-ring. It is thought that the interior of the moon may be warm enough to cause water volcanism (geyser-like), which should throw off particles in the vicinity, possibly supplying particles to the E-ring. More observations are planned, particularly during the very close flyby in July, planned for 109 miles from the surface of Enceladus.

A **new moon**, temporarily named S/2005 S1, has been found in the Keeler gap, located near the outside of the A ring. The existence of the gap and ripples found in edges of the gap pointed to the probability that a moon existed

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there. This is a similar situation to the moon Pan that orbits in the Encke gap, and maintains that gap and ripples its edges. S/2005 S1 is only about 4 miles across and causes quite a series of ripples in both the inside and outside edge of the gap, which then smooth out some time after passing the moon. Further observations will be made of the effects on the nearby ring particles to determine the mass and density of the newly discovered moon.

Cassini took the best images yet of the small (113 miles across) irregularly shaped moon **Epimetheus**. It was found to be dotted with soft-edged impact craters. This indicates the surface is billions of years old, and has suffered some erosion of the edges of craters. Epimetheus shares the same orbit as the moon Janus, and every four years one overtakes the other and they swing around gravitationally into the other's position. Both play a role in creating intricate waves in Saturn's rings. Infrared spectra show Epimetheus is mostly water ice, but its density is too low for that, indicating it must have void spaces inside, similar to other small moons of Saturn.

Cassini has taken quite a few spectacular images of various moons against the background of the rings, nearly edge on. It has also studied Hyperion, a moon of irregular shape that tumbles chaotically rather than rotating.

For the next few months Cassini will concentrate on **ring observations**. Its current orbit takes it to both the lighted and shadowed side of the rings, at a tilt of 24 degrees to the ring plane. Later in the 4-year mission there will be 2 more ring observation periods, both at higher angles. Observations include high-resolution color images, radio mapping, studying the thermal (infrared) emissions, occultations of stars by the rings, and occultations of the spacecraft radio signal by the rings.

An analysis of Cassini observations of **Phoebe** concluded that it more closely resembles Pluto or other Kuiper Belt objects than the other moons of Saturn. So it probably formed in the Kuiper Belt (beyond Neptune's orbit) and was later captured by Saturn. Supporting this view are Phoebe's orbit, mass, and proportions of rock and ice.

A study of the equatorial ridge (13 miles high and going about half way around) and the dark half of the moon **Iapetus** has concluded that they were caused by orbiting repeatedly into the edge of a ring and sweeping up its material. Most collisions with ring material would occur at the equatorial plane and on the leading side of the moon, exactly where the ridge is now. The dark material is believed to have been distributed over about half of the moon by a wind set up by all the collisions near the equator. This would require that in the distant past Iapetus was in an eccentric orbit with the close point near where the bright rings are. The theory matches the shape and location of the ridge and the shape and edge characteristics of the dark area. Then after sweeping up ring material, an encounter with another moon would have to change its orbit to its present one, far from the rings. Encounters by a moon in an eccentric orbit with other moons that are in circular orbits are statistically fairly likely, given astronomical time periods. The dark side of Iapetus has been known for 3 centuries, but the ridge was recently discovered in Cassini images.

Moons discovered – 12 additional moons have been discovered and confirmed orbiting Saturn in images taken by various telescopes in Hawaii. They are each about 2-4 miles across, orbit quite far from the planet, and all but one orbit the opposite direction (retrograde) from nearly all large moons. These characteristics indicate that they are probably captured asteroids, rather than moons that formed near Saturn in time and location. Along with the moon in the Keeler Gap mentioned above, Saturn now has 47 known moons.

Early star – A star has been found with the lowest content of iron ever measured. The first waves of star formation after the Big Bang are believed to have substantially raised the iron content of gas clouds out of which later stars form. So this iron-poor star must be one of the earliest stars to form after the Big Bang. A surprise was that the star did not have proportionally small amounts of carbon, nitrogen and strontium. The star with the next lowest known iron content also has disproportionately higher carbon and nitrogen content. Another surprise was that no lithium could be detected in the spectrum.

Mass extinction – The largest mass extinction known occurred about 251 million years ago. A new study of the oxygen level in the Earth's atmosphere shows that it dropped to a low of about 12% at that time, far less than the 21% today. The oxygen lost was mostly replaced by carbon dioxide. The oxygen drop and carbon dioxide rise added to the other reasons for dying of species, such as volcanic or impact, might explain why this extinction was the worst of all those known, with more than 90% of all marine species dying out.

Mars axis – It is generally believed that Mars has changed shape over billions of years, and that should make its polar axis wander about. Examples of the changing shape are the formation of giant volcanoes and the rising of the 5-mile high Tharsis bulge. A recent study of large impact basins on Mars showed that 5 of those basins lie along a great circle. The most likely explanation for that is that they were all formed from a single source and should therefore mark the equator of the planet at the time. So the polar axis then would be near the present equator. Impacts of such large bodies would likely have occurred early in the history of the planet, probably during the presumed early period when water flowed on Mars. *(continued on page 8)*

WHY DO OUTREACHES?

Bill Hepner

The outreach season for schools is almost over, but there is the summer to help with Explore the Stars program at Palomar Observatory campground.

Have you ever participated in an outreach? If you have not perhaps its time to give it a go! I've been asked by some that know who are not A.A folks (that's Amateur Astronomer not Alcoholics Anonymous) why I do it? Even some A.A. people have asked that question as well. To put in simple terms, I like to try to help initiate an inquiring mind. But there is more to it than that! There are both young and old that has never looked at the heavens though a telescope. I know it may hard for some of you to believe that there are people who have never gone out of the city or town they live in, or people who have never seen a forest or even a cow in person. But they do exist. Some may not care, some just don't know that such things exist and think such are fairie tales. That was my experience with some inner city kids from L.A. one summer. And of course there are those who simply do not look.

I grew up in Riverside at a time when one could still see the Milky Way and the limiting visual magnitude was 6.5. Even with skies like that there were many children and adults that never looked at the stars. I began doing outreaches when in my junior year in high school. I met Warren Estes, one of the founders of the Riverside Astronomical Society and Doc Bailey whose telescope design was used as the model for the 200 inch Palomar Observatory. Ok, what does that have to do about doing outreaches? Well, it was because of those two fellows that I came to have a love of Astronomy. They opened my eyes and mind to a new world of interest for me. Warren was an elementary school district. I had obtained a 4.5" dynascope and with that scope I joined him in giving talks and the opportunity for people of all ages at city parks and schools in the Riverside and Corona area.

In those days a 6" reflector was a big scope, the average was 4.5". Today, many of us have much larger scopes costing thousands of dollars. Many ask us how much it cost? The cost may prevent many from becoming a visual observer, but not all because not all of us use expensive equipment. I usually arrive with my 90mm ETX, or my Orion StarBlast or my 6" reflector with a homemade dob base. And we more often find our Barbara Toy with her Binoculars. It's not the size of the scope; it's not the cost. Have a scope but don't think your knowledge is good enough? Not all that look through a scope ask questions. Some may say **WOW**, some may not say anything, some say "Thank you."

I found that with each outreach that I did, there was someone who went away with a different look in his or her eyes, a different view of his/her place in the world, or someone who began to ask the WHY and began to think! I have been approached by people whom I've met when they were young at an outreach and thanked me 20 or 30 years later for giving them a new outlook of the heavens or even the gift of becoming an amateur astronomer. I have a saying that pervades my persona: **"A JOY SHARED IS A JOY DOUBLED!"** You may produce an interest in academic Astronomy or observational Astronomy or someone to build and use a telescope as a hobby by just providing the opportunity to look through a telescope...So why don't you join us sometime and share your joy of astronomy with someone! After all, that's what an outreach is all about! Hope to see you out there sometime!

THE GREAT PERMIAN DIEOFF

A Book Review By Gordon Pattison

While astronomy has made great strides in the last 10 years, we should not overlook important related discoveries made by geologists in the last 5 years. They appear to have very recently resolved one of geology's great controversies: what really happened on the earth 150 million years ago? Put simply, 95% of all the plants and animals on the land and in the sea became extinct.

There were multiple causes, a sort of chain reaction. First, a huge lava eruption in Siberia occurred, called the Siberian Traps, which lasted for 600,000 years and covered over one million square miles up to a mile thick. "Traps" comes from the Swedish word "trapp," meaning staircase. The Traps spewed immense quantities of dust, sulphur dioxide and carbon dioxide that spread world-wide. This in turn caused a runaway greenhouse effect and raised the earth's temperature by 6 degrees. The frozen gas hydrate deposits under the Polar Sea thawed out and exploded in immense geysers. The carbon dioxide caused global super anoxia that, among other things, killed plankton. When the plankton died off, the basic oceanic food chain was broken. The recovery of life was slow, and took millions of years

You can get all of the details and much more in "When Life Nearly Died: The Greatest Mass Extinction Of All Time" (2003) by Michael Benton, Professor of Vertebrate Paleontology at the University of Bristol. The book has a large number of drawings and charts. It details a real horror story and is a great read. The Orange County Library has copies.

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Mars rover Opportunity developed a problem with the steering motor on its right front wheel. Controllers plan to simply not use that steering motor until the problem is understood. On April 26 the rover got stuck while driving over a sand ripple about a foot high. This ripple appears to have been softer and steeper than usual, since the rover has driven over many ripples of about this height without problems. As we go to press, the controllers believe they have a plan to drive away. The plan was developed through experiments done with a rover at JPL in Pasadena after building a sand ripple that duplicated the Martian one. While stuck in the sand, the rover took extensive pictures of the Etched Terrain that it has been driving toward for the past few weeks and has nearly reached.

The other rover **Spirit**, while climbing Husband Hill, has discovered layered rock tilted at angles, suggesting it is bedrock thrust up by geological forces. Rocks studied on this hill have been found to be much older than those on the plains where the rover landed. Spirit has found a lot of geologically interesting rocks during this climb, and recently took spectacular color panorama pictures from the high perches.

Mars Polar Lander (MPL) – Using images taken by the Mars Global Surveyor, coupled with a new analysis of where the MPL was when it was lost in 1999, and comparing with the newest images of the landing areas of the Mars rovers, scientists are fairly certain they have found the MPL and its parachute. The Lander itself is surrounded by rocket blast marks resembling those of the rover landings. The brightness of the parachute matches that of the rover parachutes. The position of the parachute essentially rules out any of the failure explanations that would occur before the final landing rocket blast. This tends to confirm the explanation considered most probable, and that is that the touchdown detector registered what it mistakenly thought was the ground while still at about 130 feet altitude, allowing the spacecraft to fall to the ground and smash. Further even higher resolution pictures will be taken to see if more can be found out about the loss of MPL.

Mars Express (European orbiter) – A computer modeling of the Mars Express spacecraft done soon after its launch showed that deploying the radar antennas might damage it, so deployment had been delayed until May in order to determine how to most safely do it. The first of the 3 antennas, one about 65 feet long, was deployed May 4 and was soon found not to have locked in the open position. After analysis of the problem, spacecraft controllers turned the other side toward the Sun, and within an hour the heat expanded the antenna and it successfully locked. The other 2 parts are expected to be deployed in a few weeks. The radar will allow mapping the Martian subsurface as deep as a couple of miles, and is expected to find any underground reservoirs of water or ice.

Exoplanet orbits – A study of the eccentric (non-circular) orbits of 3 planets orbiting the star Upsilon Andromedae showed that the only reasonable cause for the eccentricity was that a 4th planet wandered through the system and disturbed the orbits by its gravity. This suggests that the large number of eccentric orbits found among known exoplanets (planets outside our solar system) is probably the result of wandering massive planets. Apparently our solar system was lucky to retain fairly circular orbits. If the Earth's orbit were not nearly circular, the temperature swings would not be conducive to life.

Exoplanet imaged – The recent image claimed to be a planet (called 2M1207b) orbiting a brown dwarf, possibly the first image of a planet outside our solar system, has been confirmed with further observations. The claimed planet is moving with the brown dwarf across the sky. This essentially rules out the possibility that a distant dim star was being mistaken for a planet in the image. Additionally a spectrum taken at the European Southern Observatory in Chile showed that it was too cool to be a star. The planet orbits at a distance about twice that of Neptune from the Sun. Its mass, measured indirectly, and therefore imprecisely, is roughly 5 times that of Jupiter. A number of factors made this an easy enough target that imaging was even possible with current technology: it is still hot from its formation so as to glow in infrared, it is far from its star, and its star (a brown dwarf) is dim enough to not overwhelm its light. The same observational technique imaged a second planet (about star AB Pictoris), but estimates of its mass put it at the border of being a brown dwarf rather than a planet.

Gravitational magnification – Researchers using data from the Sloan Digital Sky Survey have statistically measured the average magnification seen in 200,000 very distant quasars caused by gravity of all intervening matter, including dark matter. This magnification is part of the gravitational lensing effect predicted by General Relativity. Previous attempts to measure this had resulted in conflicting results, apparently because they did not until now have a large enough sample of quasars. The new results agree with other types of observations that show there is much more dark matter than visible matter.

Galaxy clusters – Astronomers using the XMM-Newton and Chandra X-ray telescopes have studied distant galaxy clusters in order to compare them with nearby galaxy clusters. The distant clusters were seen as they were when the (X-ray) light left them 6-8 billion years ago, so the comparison was effectively between clusters today and clusters when the Universe was about half as old as it is now. The temperatures and luminosities (brightnesses) were measured, and from this the masses were estimated. The masses were 200 to 1100 times that of our Milky Way galaxy. The comparison showed that the galaxy clusters of long ago were like those of today except for the known effects of the expansion of the Universe in the intervening time.

Chandra (X-ray observatory) has imaged for the first time in X-rays a pair of interacting stars (the Mira AB system), those orbiting quite close to each other. Evidence was seen in the observation that hot matter was streaming between the two stars. It had not been established whether this pair was transferring matter only through stellar wind, or if matter was also being pulled gravitationally in a stream. A surprise was the detection of an outburst of X-rays from the giant star that is losing mass. Theorists had believed that such outbursts should come only from matter falling into the hot disk surrounding the companion white dwarf.

Chandra has been observing the **Orion Nebula** to study forming stars in X-rays. 1400 young stars were found in the observations, of which about 30 are quite like the Sun was soon after it formed. Chandra detected enormous flares from these young Sun-like stars, far greater in size, energy and frequency than flares on the Sun today. Such huge flares during the time of planet formation should cause turbulence that helps rocky planets form and maintain their orbits. So the flares need to be added to the computer models of how planet systems form.

Solar wind – A team of scientists using the SOHO orbiting solar observatory has identified the magnetic structures in the solar corona where the fast solar wind originates. The solar wind flows from funnel-shaped magnetic fields that are anchored in the lanes of the magnetic network about 12,000 miles above the surface of the Sun. Previously it was believed that the solar wind originated closer to the surface. At the origin, the solar wind flows at only 6 miles per second, but is accelerated before being flung free of the Sun.

Instant AstroSpace Updates:

Sedna, the large and distant Kuiper belt object, has been studied spectroscopically in infrared and its surface does not contain much water or methane ice, and so is unlike Pluto or Charon. Due to Sedna's great distance from the Sun, its surface has probably remained nearly unchanged for millions of years.

Solar nebula – By measuring the ages of 2 different kinds of material within meteorites, scientists have determined that the nebula out of which the solar system formed lasted only about 2 million years, less than most theorists believed. The materials, chondrules and calcium aluminum-rich inclusions, should form at the end and beginning of solar system formation respectively.

Spitzer (infrared space telescope) has spotted what appears to be the dust created by collisions of asteroids in a belt orbiting another star (called HD69830) about the same size and age as our Sun. The two other known asteroid belts outside our solar system are both about young massive stars, unlike our Sun.

Spitzer also observed the **Sombrero Galaxy** in infrared and was able to trace the dust ring all the way around, whereas only the near side can be seen in visible light. The galaxy's disk was found to be warped and clumpy star-forming regions were found on the far side.

Spitzer also discovered a nebula that appears to be forming into a galaxy. It is essentially devoid of starlight, but already appears to have an active black hole at its center, implying the central black hole forms before the surrounding galaxy.

Using the Very Large Telescope in Chile, the most perfect **Einstein ring** known has been discovered, with about 3/4 of a circle visible. Einstein rings are created by gravity of a foreground object bending the light from a distant object (galaxies in this case); the closer the alignment of the objects, the closer the image is to a ring.

The **smallest coronal mass ejection** (CME) (an explosion that throws charged particles into space) ever seen has been observed on the Sun. It displayed far more twisted magnetic field lines than larger CMEs, as well as being smaller in area, so theories may have to be revised.

The first **Space Shuttle** launch since the Columbia disaster has been postponed until a launch window beginning July 13. Problems, chiefly ice forming and sensors failing, found during fueling tests on the external tank prompted the delay.

The new NASA chief Michael Griffin has ordered work resumed on planning a Shuttle mission to **repair the Hubble** Space Telescope, though he has not made a decision on whether to fly such a mission.

Astronomers using the Japanese Subaru Telescope in Hawaii have imaged in infrared and millimeter waves the structure of **dust and gas** about a very young star by using a new technique: it is imaged in silhouette because it happens to lie in front of a glowing nebula.

The Very Large Telescope in Chile has reached another milestone in its development of **interferometer** capabilities: for the first time light was combined interferometrically from 2 of the movable outlier telescopes.

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