

On November 18, 2003, the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) on NASA's Terra satellite acquired this image of the Old Fire/Grand Prix fire east of Los Angeles. The image is being processed by NASA's Wildfire Response Team and will be sent to the United States Department of Agriculture's Forest Service Remote Sensing Applications Center (RSAC) which provides interpretation services to Burned Area Emergency Response (BAER) teams to assist in mapping the severity of the burned areas. (Image Credit: NASA/GSFC/METI/ERSDAC/JAROS, and U.S./Japan ASTER Science Team)

OCA CLUB MEETING

The free and open club meeting will be held Friday, December 12th 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 Dr. Ken Crowell, author of *Magnificent Universe*, with yet another fascinating topic!

STAR PARTIES

The Black Star Canyon site will be open this month on December 13th. 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 December 5th (and next month on January 2nd) at the Centennial Heritage Museum (formerly the Discovery Museum of Orange County) at 3101 West Harvard Street in Santa Ana.

The EOA SIG:
Dec. 17th, Jan. 21st
Astrophysics SIG: Dec. 19th
Astro-Imagers SIG: Jan. 20th

President's Message

By Barbara Toy

Well, we're getting on toward winter, when some people avoid viewing because of the cold. There are many ways of dealing with cold temperatures, though – and no substitute for what you can see on a clear dark winter's night! So, pack your favorite cold weather gear (don't forget the gloves and hats), maybe throw in a couple chemical hand-warmers, and join the hardy winter-time astronomers out at the Anza and Black Star Canyon star parties! Orion, Saturn and Jupiter are just the beginning of the great objects for winter viewing...something to be truly grateful about! Speaking of which, I hope all of you had a great Thanksgiving!

The OCA Election

Final nominations for the 2004 Board are at the December general meeting. The candidates as of the time this is written are:

Trustee: Bob Buchheim, Dave Radosevich, Joel Harris, Gary Schones, Craig Bobchin

Officers: Treasurer – Charlie Oostdyk; Secretary – Bruce Crowe; President – Barbara Toy

The Board consists of a total of seven Trustees and four officers, so we need at least two more people to run for Trustee to have enough for a full Board, and one to run for Vice President. We would really like more candidates than that, especially for positions such as President and Vice President, so don't feel shy about putting in your nomination!

At other times, I've written at length about the Board, what it does and how it does it, so I won't repeat that here. There is an article explaining the Board that we are re-posting on the website. If you can't find it, please let me know and I'll be happy to forward a copy.

The membership of the Board has changed a little since the article was written, but the way it works is the same.

Being on the Board remains one of the best ways to influence the club's direction and to find opportunities to do things that you might otherwise never have known about. As an example, one of my great joys is working with the Kuhn telescope, but I doubt that I would have become as involved with testing it and now in training Star Members in how to use it if I hadn't been on the Board and, as a result, seen the need (and the opportunity) early on in the process. Getting to know and work with the different people on the Board is also a great way to add to your enjoyment of club activities.

As I said, we're short a few candidates for a complete slate – so this is a particularly good time to throw your hat in the OCA ring and run for a Board position!

The Vice Presidency

For some reason, the position of Vice President has often been hard to fill, even though it's really a great position. You get prestige and a chance to come in contact with a lot of different people in the club and in the astronomical community outside the club without having to do nearly as much work as the President. There are some responsibilities, of course, the most important of which is making sure that we have a speaker for the general meeting each month and for the Banquet – but dealing with the speakers is a lot of what makes that office fun!

The Vice President doesn't actually have to go out and find all of the speakers directly. In fact, one of the best ways to get a variety of speakers is to get the word out among other club members and anyone else you might run into in the world of astronomy and ask for

suggestions. Sometimes people can give you a name or two right away, but often just knowing that you're looking for speakers will cause them to take note when they come across a likely prospect, and they'll happily pass that information on to you and maybe even introduce you to the prospect. Even better, sometimes the person who comes up with the lead is willing to make the actual arrangements, and all the Vice President then has to do is coordinate the efforts so there aren't conflicts or gaps in the calendar. It's amazing what a variety of contacts our members have and how helpful they are, and also how many of them are excellent prospects as speakers themselves. And the quest for speakers is a great reason for contacting people you might otherwise have been too intimidated to contact, which is a good way to increase your own knowledge of the astronomical world.

So – for those of you who've served on the Board at any time in the past – here's a great opportunity to take on one of the most entertaining positions the club offers! Just let me know you're interested, and I'll be delighted to ensure that you're properly nominated at the December meeting!

Still More Changes...Welcome to Larry Carr and Bob Bell as New Coordinators!

We've certainly seen a lot of changes in our volunteer positions over the last few months.

We're very

fortunate that two of the most recent vacancies have now been filled. Larry Carr is our new Anza House Coordinator, and Bob Bell is the new coordinator for the Telescope Loaner Program. We are really pleased and grateful that they have been willing to take on these positions, and we would like to thank Stephen Eubanks and Henry

Happy Holidays from
all of us at OCA!!!

Fry again for all they did during the time they've held these positions.

Explore the Stars

We still need someone as Coordinator for Explore the Stars. If you have any interest in the Palomar area, this position gives a great opportunity to build good working relationships with the Forest Service and with the astronomical community at Palomar Mountain, particularly Scott Kardel, who is now in charge of public relations for the observatories.

Explore the Stars is also an excellent program for building bridges between all of the different astronomy clubs in the East Riverside County/North San Diego County/Orange County area. We share a strong interest with all of these groups and with the Palomar observatories in controlling light pollution in the area, so any bridges we can establish with these other organizations is important to us – as is the chance to demonstrate to people who are visiting the mountain just why excessive light is a problem! In short, ETS is an important program that promotes many of our club's goals and interests, and the position of coordinator is critical to the success of the program.

Richard Cranston has done a great job of keeping the program going through the many difficulties of the last couple years, including the fact that many of the sessions in the summer of 2002 had to be cancelled due to the construction going on at Observatory Campground. Changes in his life have made it increasingly difficult for him to continue coordinating the program. He's attempting to pass the baton early enough that the transition can be made smoothly – and we're all very grateful for his foresight as well as for all of his efforts as coordinator.

If you would like more information about the program or the position of Coordinator, or would like to

volunteer for the position of Coordinator, please contact Richard (rcransto@ix.netcom.com), Russ Sipe (sipe@sipe.com) or me (btoy@cox.net).

Asteroid Named for Tom Cave III

You may remember that several months ago the very effective asteroid-hunting team of Minor White and Myke Collins asked for suggestions for names for several of the asteroids they discovered. They received many excellent suggestions, and put together the information they needed to submit the ones they felt were most appropriate for official approval. They have finally received word that some of these have indeed been accepted as official names. One that is of particular interest to those of us in the world of amateur astronomy is the one named for Thomas Cave III.

The minor planet that is now known officially as "TomCave" is a member of the Eunomia asteroid family, a group of asteroids that resulted from a violent collision with the parent body, Eunomia. MP #62503, now "TomCave," was discovered on September 19, 2000 by Myke and Minor using the Kuhn Telescope.

Tom Cave was an ardent amateur astronomer and telescope builder, and built his first telescope at the advanced age of eleven years. It was the first of many, and there are still many astronomers out there who are proud owners of telescopes he made. He was also known for his careful observations of Mars and his many detailed drawings of his observations, which are a tribute to what the trained human eye can see with enough time and patience, along with good optics. It is unfortunate that he had been in poor health, and that he died before the close approach to Mars this last August – had he been healthy enough to observe, he would undoubtedly have enjoyed the views tremendously!

Monsignor Royer, a long-time friend of Tom Cave, recommended his name for an asteroid. Those who were at our general meeting in May, 2003, when Monsignor Royer was our featured speaker, may recall that Tom was there to hear his talk. We were delighted that he could be present, and very sorry to learn of his death not long after that meeting. Giving his name to an asteroid is indeed a fitting memorial to one who did so much for the world of amateur astronomy.

More information about the asteroid, and about Tom Cave and Monsignor Royer will be available on Myke and Minor's website, so please check it out at <http://www.mpc643.org>.

In Closing...

Seriously, do think about running for the Board. It's a great way to contribute to the club, and to have a good time doing it – and we need you. And don't give up on winter observing just because it may be a bit nippy out there!

THE LIBRARY NEEDS YOUR HELP!

Hi there! Karen Schnabel here, the OCA librarian. I am actively seeking donations from our members. Books are the most welcome, but I will also take Astronomy and Sky & Telescope magazines. As most of you know, the donated books and magazines are sold at RTMC each year, which helps support the new purchases for the library. I would like to start the "gathering process" as early as possible so that I can do a better job of inventorying things for RTMC 2004. I currently have some books for sale already and will have a table set up at the December 12th meeting, next to the library. This way our members will get first pick! The current list of available titles is on the OCA website, under [Resources](#) and then [Books for Sale](#). Prices range from \$1 to \$40

Virtual Astronomy

by Dave Kodama

The warm weather of late October turned out to be a dubious blessing. The fires that it brought to Southern California were a huge disaster, and though the evenings were pleasantly warm for astronomy, smoke clouded the skies for at least a week. But the coincidental appearance of some very large active regions on the sun (unusual for this late in the solar cycle), brought sunspots large enough to be seen with the unaided eye. For at least a few days, the combination of smoke and sunset transformed the sun into a strange, deep, deep red ball hanging just above the horizon, with sunspots clearly marking the solar activity. Even



non-astronomers were remarking to me that they had noticed spots on the sun!

For spectacular close-up views of the late October solar activity in both white light and H-alpha, check out this link:

<http://www.astro-nut.com/sun-blink-03oct25.html> - White light / H-alpha overlay view

Along with the large sunspots came auroral activity resulting from eruptions in the same active regions of the sun. Many photographers (even in California!) were able to capture excellent shots of this:

<http://www.borealis2000.com/October2903Aurora.html> - Dirk Obudzinski (N. Cal.)

<http://www.cloudbait.com/gallery/solar/aurora3.html> - Chris Peterson (Colorado)

<http://www.abmedia.com/astro/current/aurora-103003-27.html> - Chris Cook (Eastern U.S.)

<http://www.abmedia.com/astro/current/aurora-103003-36.html>

http://science.nasa.gov/spaceweather/aurora/gallery_01oct03.html Spaceweather.com gallery

November Disappointments

Early November brought a couple of disappointments. The first was a lunar eclipse which was only half visible here in California (at best). Like the lunar eclipse we had in May, the moon rose already eclipsed. But this time it was also covered by clouds for the majority of us, since our weather had abruptly gone from warm, dry winds to severe rainstorm and even hail! Fortunately we can enjoy views via the Internet from photographers who were better placed for the eclipse in the Eastern U.S.:

http://www.kwastronomy.com/Lunar_Eclipse_2003.htm - Kevin Wigell

http://www.astrophoto.ca/moon_eclipse_20031108.html - Philippe Chrétien

<http://www.abmedia.com/astro/current/lunar-eclipse110803-composite.html> - Chris Cook

The other disappointment in November was that the Leonid meteor shower had returned to its "normal" level of activity. Nevertheless, some familiar long-time meteor photographers were out under the stars to give us images for us to appreciate:

<http://www.ocastronomers.org/astroimages/album.asp?ID=811> - Wally Pacholka

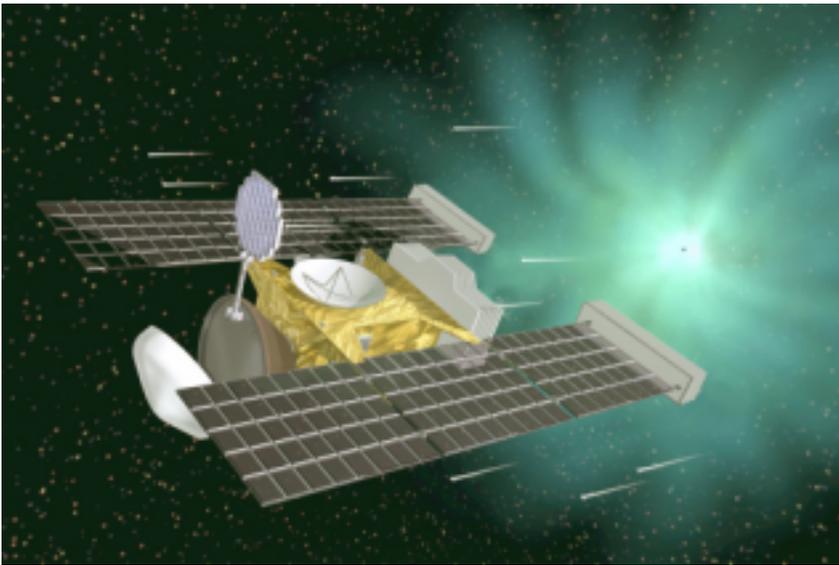
<http://www.comet-track.com/meteor/leonids03/leonids03.html> - Bob Yen

The upside of November is that the large active regions visible in October have come back around the sun. With luck they'll provide us with more daytime observing opportunities.

NASA's Space Place

Stardust

by Patrick L. Barry and Dr. Tony Phillips



Philosophers have long sought to “see a world in a grain of sand,” as William Blake famously put it. Now scientists are attempting to see the solar system in a grain of dust-comet dust, that is.

If successful, NASA’s Stardust probe will be the first ever to carry matter from a comet back to Earth for examination by scientists. It would also be the first time that any material has been deliberately returned to Earth from beyond the orbit of the Moon. And one wouldn’t merely wax poetic to say that in those tiny grains of comet dust, one could find clues to the origin of our world and perhaps to the beginning of life itself.

Comets are like frozen time capsules from the time when our solar system formed. Drifting in the cold outer solar system for billions of years, these asteroid-sized “dirty snowballs” have undergone little change relative to the more dynamic planets. Looking at comets is a bit like studying the bowl of leftover batter to understand how a wedding cake came to be.

Indeed, evidence suggests that comets may have played a role in the emergence of life on our planet. The steady bombardment of the young Earth by icy comets over millions of years could have brought the water that made our brown planet blue. And comets contain complex carbon compounds that might be the building blocks for life.

Launched in 1999, Stardust will rendezvous with comet Wild 2 (pronounced “Vilt” after its Swiss discoverer) on January 2, 2004. As it passes through the cloud of gas and dust escaping from the comet, Stardust will use a material called aerogel to capture grains from the comet as they zip by at 13,000 mph. Aerogel is a foam-like solid so tenuous that it’s hardly even there: 99 percent of its volume is just air. The ethereal lightness of aerogel minimizes damage to the grains as they’re caught.

Wild 2 orbited the sun beyond Jupiter until 1974, when it was nudged by Jupiter’s gravity into a Sun-approaching orbit-within reach of probes from Earth. Since then the comet has passed by the Sun only five times, so its ice and dust ought to be relatively unaltered by solar radiation. Some of this pristine “stuff” will be onboard Stardust when it returns to Earth in 2006, little dusty clues to life’s big mysteries.

To learn more about Stardust, see the mission website at stardust.jpl.nasa.gov. Kids can play a fun trivia game about comets at spaceplace.nasa.gov/stardust

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

Impressions of Starry Nights Festival

by Bill Hepner

As a first timer at the Starry Night Festival held in Yucca Valley by the Andromeda Society, I was taken by way it was presented and the way this little (growing) town on the way to Twenty-Nine Palms welcomed and aided in this event. The event had a small but enthusiastic audience of varying interest.

The Festival was held in the Yucca Valley Community Center. This year there was no charge to attend as the event was sponsored by the city. The festival actually began Friday with regional meeting of the International Dark Sky Association and also the annual meeting of the Western Region of the Astronomical League and a formal (not the dress type) greeting by the city.



In the evening, OCA member Wally Pacholka gave a workshop at Machris Park on how to take astrophotos with simple cameras and equipment.

We (Matthew Ota and myself) arrived on Saturday morning before the speakers' presentations. We set up Matthew's LX50 in the courtyard with the Telescopes In Education Foundation's Coronado H-alpha scope piggybacked for solar viewing. Solar viewing was between talks attendees came out to look at the sun through the scopes. Being next to the museum and the recreation center many non-attendees also came to look during the afternoon.

In the foyer of the center they had Sandwiches, popcorn, and drinks for sale at very reasonable prices (average One Dollar). Our Wally Pacholka had some of his best prints for sale also. In the morning before our arrival, there was a Starry Nights 5K run which was held in excellent weather for such an event. The presentations started at 1pm and continued until 4pm. The talks given by the presenters covered subjects from Astronomical subjects to pseudoscience (New Age). Sam Davidson gave a introductory talk titled "Astronomy for Dummies". Joanne Karl introduced attendees to the relationship between "the Integratron", a structure alleged to be designed to be free of the effects of the earth's magnetic field. Dr. Gary Peterson of JPL presented his "Geological Case for Life on Mars" suggesting that at one time Mars

had large amounts of water based on his observation of landforms.

Then there was a raffle held with 2 eight-inch F5 dobs being the big prizes. There were numerous dinners given away, a picture by our own Wally Pacholka, books autographed by David Levy and two \$100 gift certificates donated by Starizona.

Following the raffle was the featured speaker, David Levy. His presentation "Comets, collisions, and the evolution of life: one person's adventure as a comet searcher", was an excellent talk. He covered of the history of comet hunting from the late 1700's to present day automated sky surveys. He also related his ongoing personal searches for comets, even though he has not sighted a new one in recent years. He stated that the majority of comets found in recent years have been an outshoot of the Near Earth Asteroid searches.

Saturday night was the main star party from 7 to 10 pm. It was held at Machris Park, the same park that Wally held his workshop. The city had a truck at the turn off with flashing lights and someone to direct us to the park. The city also had a series of shuttle buses leaving the community center because parking space at the park was limited. There were about 20 telescopes set up of varying sizes and types. Among them was Sandy Bumgarner who designs remote telescope control systems and modifies web cameras and security cameras for astronomical use. He was demonstrating the use of a Mintron security camera with a 4-48mm video lens piggybacked on a Celestron NexStar 5. The aperture of the lens was about 30mm but with the system he could place the Andromeda Galaxy on the 9 inch B&W monitor. The galaxy image showed at about 2" in size and showed stars down to 10th magnitude.

Other scopes which I observed through was a 80mm MegaRez refractor, a homemade 8" Maksutov, an 8" Celestron NexStar, a 12.5" Discovery Newtonian dob, a 12" Meade LX-200GPS, a pair of Vixen 125x20 binoculars, and some ETX's ranging from 90mm - 125mm aperture. The treat of the night was the Cave 6" Astrola Newtonian reflector belonging to David Levy. With many non-astronomers attending, it took on the look and feel of an outreach. The viewing area, although being a city park, had excellent sky visibility. The city even turned down the lighting along the main highway to reduce any light pollution and provided some plastic sheeting to the chain link fence as a windbreak. The park attendants assisted with setting up equipment when needed. The sky was excellent with 6.5 magnitude skies. The city lights were turned down by its residents, providing excellent contrast for viewing deep sky objects.

David Levy's 6" scope gave the best contrast views. With it I was able to see the Veil Nebula in Cygnus without a filter. I was also able to view many other deep sky objects with instruments of less than 10 inches in aperture. With the way the city helps with this small festival and the pleasant hosts, this first timer at the festival will return. For those that did not go, I say you missed a good time and a lot of interesting people. The festival occurs each October and while it may not attract large numbers it represents a good cross-section of open minded humans interested in enjoying the stars!

Back in Those Days — #1 Looking at our hobby and ourselves in days gone by.

by Russell Sipe

From time to time during the past year you could walk through the fifth floor of the Science Library at UCI and, if your timing was right, you might have observed a somewhat strange sight. There among the darkened stacks you might have observed a 50



year old round faced slightly balding man, clad in an aloha shirt bent over a stack of *Sky & Telescope* magazines, snickering to himself. Perhaps you would think you'd stumbled

on a 50 year old undergraduate who had perfected the "professional student" life style. Or perhaps you thought the fellow was a graduate student going back for an advanced degree after having being laid off in the aerospace industry. Whatever you surmised, it certainly would have seemed odd to you that the man was snickering to himself. What gives?

Let me solve the mystery for you. The bemused somewhat misplaced fellow would have been me. And the source of my mirth would have been some of the articles and advertisements found in old back issues of *Sky & Telescope*. One of my projects in 2002-2003 at *Sky & Telescope*, where at that time I was the Electronic Publishing Coordinator and past Webmaster, was the updating of the magazine's database of articles, dating back to the first issue of "The Sky" in 1941.



The further I progressed back in time updating the database the more I would stumble across articles that taught me more than astronomy. Reading old magazines, regardless of their subject matter, gives insights, often humorous, of our lifestyles back in

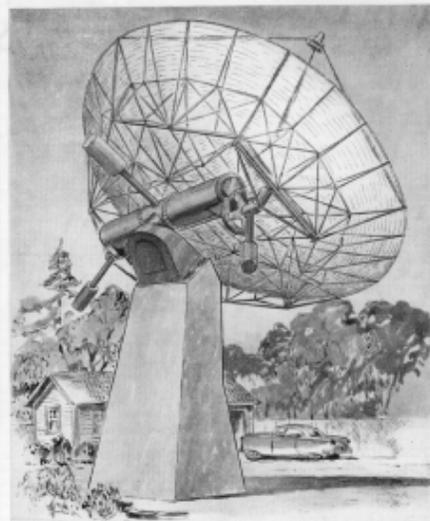
"those days". For example, in today's enlightened age an ad for any non-tobacco product would never picture someone smoking a cigarette. Yet in a 1960's *Questar* ad a self-confident man walks along, his *Questar* case hanging from his shoulder and a cigarette poised between his fingers.

I think I just detected a smile on your face.

So I thought it might be fun to share some of these entertaining and enlightening "discoveries" with you. This month we take a look at a case of serious hi-tech amateur astronomy.

Anyone that has been to our Anza site has seen my Star Cruiser Observatory from where I conduct observing sessions from home via the club's Internet satellite link. As it so happens our satellite dish is right next to *Star Cruiser Observatory*, mounted on the side of the club observatory. With that image in mind you can imagine my mirth when I saw the cartoon above in the September 1981 issue of *S&T*. Back then it was indeed a humorous image. But today, whether

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October, 1955, SKY AND TELESCOPE 515

it's a communications dish or a radio telescope, the fact is the cartoon depicts reality for a growing number of amateur astronomers around the world.

But if you go back deeper into the pages of *S&T* you would stumble onto what is truly a funny image in a display ad in the October 1955 issue (left). Now that's a dish! I wonder what the neighbors thought. And I can hear it now "Honey, you'll never guess what I bought today."

That's it for this month. Be sure to check back next month for another romp in the past back in *those* days.

ASTROSPACE UPDATE

December 2003

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.

Hidden black holes - Integral (European gamma-ray space telescope) has discovered a new class of astronomical objects — binary stars containing one black hole, or possibly neutron star, orbiting a massive ordinary star, both embedded in a thick cocoon of cold gas. About 300 such binary stars, but without the cocoon, are known to exist in our Milky Way galaxy. But the shrouded version had never been seen until now because the cocoon blocks all types of light except the most energetic (gamma rays). The cloud of cold gas is thought to be created by the stellar wind from the massive ordinary star of the pair. Three instances of this type of object have been found so far, and the search continues.

3-D map of the Universe - Astronomers from the Sloan Digital Sky Survey (SDSS) have made the most precise measurement to date of the cosmic clustering of galaxies and dark matter in the Universe. This is in pursuit of one of the goals of the survey, a precision measurement of how galaxies cluster under the influence of gravity. This clustering tells us about the presence of dark matter and about the seed density fluctuations left over after the Big Bang. So far SDSS has mapped over 200,000 galaxies up to 2 billion light years away over 6% of the area of the entire sky. The data support other types of measurements (such as the Cosmic Microwave Background and Supernova surveys) that imply the Universe is 70% dark energy, 5% ordinary matter, and 25% non-baryonic (not protons and neutrons) dark matter. The SDSS results show that neutrinos do not constitute a substantial fraction of the non-baryonic matter, and put the strongest yet upper limits on the mass of neutrinos. The results also are consistent with the predictions of Inflation Theory, and lowered the uncertainty of our best estimates of the density of the Universe and the Hubble Constant (rate of expansion). SDSS uses the 2.5-meter telescope at Apache Point, New Mexico, to CCD image the sky to very deep magnitude using 5 different filters during all clear moonless night time, and takes spectra and redshifts of hundreds of galaxies simultaneously when the moon is up. This produces 37 gigabytes of data per hour.

Dark matter theory - Generally accepted theory now says that after the Cosmic Microwave Background radiation was released (about 400,000 years after the Big Bang), the fluctuations of density of matter grew over millions of years by gravitationally attracting other matter into the clumps that became star clusters and galaxies. Because there is so much more non-baryonic (not protons and neutrons) dark matter than ordinary matter, it was this non-baryonic matter that clumped faster, and then attracted the ordinary matter that constitutes star clusters and galaxies. Scientists using this theory have had trouble getting computer models to generate the kind of Universe we see today. For example, most models predict that a galaxy such as our Milky Way should have thousands of satellite galaxies instead of the dozen it has. The fact that we don't have any evidence of what kind of subatomic particles make up the non-baryonic matter makes it difficult to be sure our computer models are correct. The only evidence we have for the non-baryonic matter is that mass must be there to explain gravitational forces, but that mass does not interact with any form of light. A new theory says that non-baryonic matter behaves like Brownian motion, which is the random bumping motion seen with specks of dust in the air. That is, clumps of non-baryonic matter must bump about randomly. When this is added to computer models of the Universe, the galaxies and star clusters that form appear to be more like the Universe that we see. More work needs to be done, but so far the theory seems promising.

Dark matter detector - Scientists have developed a device which theoretically should detect non-baryonic dark matter and supersymmetry particles, which could actually be the same particles. Supersymmetry theory predicts that every subatomic particle that we know about has a much heavier twin, but none has ever been discovered because our particle accelerators are not yet powerful enough. The new detector has been installed in an iron mine in Minnesota to protect it from cosmic rays and everything else that would swamp the signal they want, and has been cooled to 1/20 degree above absolute zero to increase sensitivity, in hopes that these particles occur in nature and we will detect them. It may be a race to see who succeeds in finding supersymmetry particles, since Fermilab in the US and CERN in Europe are both trying to create supersymmetry particles with their particle accelerators.

Flares from the galactic black hole - The VLT (8-meter telescope in Chile), using adaptive optics that improved resolution to better than that of the Hubble Space Telescope, has discovered powerful infrared flares caused by material falling into the black hole at the center of our Milky Way galaxy. The signals flickered on a scale of minutes. The patterns in the signals indicate that the black hole rotates rapidly, with the event horizon spinning at about half the speed of light.

Gamma-ray bursts and X-ray flashes same - New observations by the VLA radiotelescope of the afterglow of a relatively nearby (only 2.6 billion light-years away) gamma-ray burst indicate that 3 different astronomical explosions (strong gamma-ray bursts, weak gamma-ray bursts and X-ray flashes) are all the same phenomenon, but with

different energy distribution between its 2 energetic beams, and between X-rays and gamma rays. A supernova of a star large enough to create a black hole is the single cause. Immediately after the core of the star collapses into a black hole, much of the star's remaining outer material whirls into a disk about the black hole, and is sucked into the black hole within seconds. During this, much matter is thrown in beams out along the spin poles. The first beam, which is narrower, emits gamma rays and/or X-rays and the first visible light. The second (wider) beam creates radio waves and later-seen visible light. More work is needed to understand what controls the different energy put into the beams and X-rays of different occurrences of this phenomenon. Also unanswered yet is whether the narrow beam lies within the wider beam or not.

Closest galaxy - A team of astronomers has found a previously unknown galaxy colliding with our Milky Way galaxy. It is closer to the center of our galaxy than any other, and is being named the Canis Major dwarf galaxy. It was overlooked before because it is hidden by dust near the center of the Milky Way, but was found in infrared in the 2MASS all-sky survey. A long trail of stars has been stripped off the newly found galaxy by the gravity of the Milky Way. Theory had it that when small galaxies collided, they would be torn apart and most of their stars would be thrown into the outer spherical halo of the larger galaxy, but much of the stars of the Canis Major dwarf are being thrown into the disk of the Milky Way.

Largest star-forming region - A mysterious arc of light, termed the Lynx Arc, has turned out to be the biggest, brightest and hottest star-forming region ever seen. It contains about a million blue-white stars that are twice as hot (140,000 degrees F.) as similar stars in our neighborhood. It is believed that stars formed with more mass and higher temperatures in the early history of the Universe, when the gas to form stars contained essentially no heavy elements. The light from it took 12 billion years to reach us, and is distorted into the arc by the gravitational lensing of a cluster of galaxies on our line of site. The identification as a star-forming region was made on the basis of observations in X-rays, visible light and infrared.

Edge of the solar system - For many years astronomers have been predicting what the Voyager spacecraft will encounter when it leaves the area of the solar wind, which is somewhat larger than the area occupied by the planets of the solar system. First it is to hit the termination shock, where the solar wind hitting the interstellar matter creates a shock wave. The spacecraft should see increased atomic particles, abruptly slower speed of particles, a mixture of speeds of particles, and changes in the magnetic field. Recent Voyager 1 data shows the first 2, but not the last 2. So opposing teams of astronomers are debating whether the spacecraft went through the termination shock or not. Both teams have to revise their theories. Complicating the matter is that the shock should pulse in and out in response to current solar wind activity. It is possible that Voyager went through the shock and then the shock overtook it again.

Hydrated minerals on Vesta - Astronomers using the 3.8-meter infrared telescope in Hawaii have found in the spectrum of the asteroid Vesta evidence of hydrated or hydroxylated minerals (ones that contain water chemically bound). Vesta is the smallest planetary body with evidence of differentiation, which means that it once was heated enough to melt the metals in it, at which point they sank to the core, leaving lighter material near the surface. All of the major planets differentiated, but most asteroids and all comets did not. Differentiated bodies without atmospheres have never until now been found to have hydrated minerals on them, and it was believed that the heat that caused differentiation would have broken down the hydration, and lost it to space. The best guess is that Vesta reacquired the hydrated minerals after differentiation by the impact of comet fragments.

Mars is dry - Analysis of measurements from the Thermal Emission Spectrograph aboard Mars Global Surveyor shows a large area (over 11,000 square miles) rich in the mineral olivine. Smaller olivine-rich areas were found all over the planet. Olivine on Earth weathers into other minerals when exposed to water; so the conclusion is that these areas discovered on Mars have been water-free for probably the last 3 billion years.

Mars was wet - A new image from Mars Global Surveyor of a fan-shaped apron of debris contains details that imply water flowed over considerable periods of time. The details are a river meander and a channel cut across an older channel. The shape of the fan appears to indicate it was formed as a delta, that is, a river emptying into a large lake. The volume of the fan is about 1/4 of the volume cut away in the channels upstream. The apparent cementing of layers in the fan implies that some sedimentary rocks were deposited there by water. The planet could have become dry and remained so for billions of years after the newly observed fan formed. But the formation must have taken thousands or millions of years to complete, precluding the theory that flow channels on Mars were all formed by very quick flooding. Some scientists have deemed this new image the most compelling evidence that Martian channels formed over very long time periods.

No ice found at Moon's poles - Evidence from the Clementine and Lunar Prospector spacecraft observed in 1996 and 1998 indicated that there was water ice deep in craters at the poles of our Moon, in areas where the sunlight never reaches. Temperatures on the moon in sunlight have long ago removed all water from areas that we have sampled. The Arecibo radiotelescope using wavelengths that penetrate about 5 yards into rock just imaged the Moon's polar areas by radar, trying to verify the previously reported ice, but found nothing. There are 2 possible explanations: 1) something is there that is not water ice, but is erroneously picked up by both spacecraft's instruments, or 2) water ice is there, but in a form not detectable by the radar used. One way the latter could happen is if ice were finely mixed with a lot of lunar soil. Hydrogen compounds other than water could possibly cause the former. *(continued on next page)*

ASTROSPACE UPDATES (continued from page 9)

Pleiades may be 3 objects - About 20 years ago it was determined that the nebulosity seen in the Pleiades star cluster is a cloud of gas that was not associated with the stars when they formed, but later collided with the stars. New observations made at Kitt Peak show the spectrum of a second gas cloud, moving at a different speed, implying that the stars are having a double collision with gas clouds. This would be a unique occurrence. The Pleiades, also known as M45 or the Seven Sisters, consist of more than 500 stars roughly 100 million years old located about 400 light-years from Earth.

Missions proposed - NASA has selected 5 finalist proposals of low-cost Explorer space missions for further study before 2 are chosen for launch. They are: NEXUS to determine the causes of heating of the Sun's corona and acceleration of the solar wind; DUO to measure the dark matter and dark energy of the Universe through X-rays; IBEX to image the boundary between the solar system and interstellar space; NuSTAR to survey the sky for black holes; JMEX to study Jupiter's aurora and magnetosphere from Earth orbit. The Explorer program also decided to fund a balloon experiment (ANITA) to measure neutrinos striking the Antarctic ice shelf.

Ground was broken in Chile to begin construction of ALMA, an array of 64 antennas constituting a millimeter-wave (the area between infrared and radio) telescope. Its location is high (16,400 feet) in the Atacama Desert (driest place on Earth) to get away from the water vapor and atmospheric effects that reduce millimeter-wave signals. First light with a partial array is 2007, with the full array is 2012. The antennas, each 39 feet across, are movable to trade off resolution for field of view, and can be spread from 160 yards to nearly 9 miles.

Mars Express to arrive - Europe's Mars Express orbiter and Beagle 2 lander are on schedule to arrive at Mars on December 25. The 2 US landers will arrive in January. Mars Odyssey and Mars Global Surveyor, US missions from past years, continue to orbit and observe the planet. There will be a lot of Martian data and images for you fans of Martian exploration.

Nozomi to collide - The bad news for Mars fans is the Japanese Mars spacecraft Nozomi is, as I write this, on schedule to unintentionally smash into the planet December 14. It was supposed to begin its Martian orbital mission in 1999, but malfunctions caused it to fly on past Mars. The mission control team snatched victory from defeat by redirecting the spacecraft to fly by Earth, receiving a gravity slingshot that sent it back toward Mars. They overachieved, however, and it is aimed exactly at Mars, not a point above it. Unless a new spacecraft miracle is developed after I write this, there is no way currently working that it can be diverted from the collision. Nozomi was not purged of Earthly bacteria, like international agreement requires of landers, because it is not required of orbiters. It is possible that the Martian environment might kill all the Earthly bacteria without serious contamination of the planet with Earthly life, but there are no guarantees about something that has never happened before.

Instant AstroSpace Updates:

Days after long-lost asteroid Hermes was found, as reported here last month, the **Arecibo radiotelescope imaged Hermes with radar**, and determined it is actually 2 asteroids of nearly equal size orbiting each other so closely as to be almost in contact. The several other near-earth asteroids known to be binary are all large-small pairs, not equal sized.

Stereo images of Mars made by the Mars Global Surveyor have shown that sand ripples and sand dunes on that planet are taller than their Earthly counterparts; this is likely true due to the lower surface gravity, which makes Martian volcanoes higher and canyons deeper than Earth's. Further study will be done to confirm this, since wind speed and air density differences also affect this.

The European Space Agency, in a budget crunch, cancelled the Eddington spacecraft, which was to look for Earth-like planets orbiting other stars and measure the seismic vibrations in other stars. Also cut was the lander part of the BepiColombo spacecraft, leaving only the 2 Mercury orbiters.

A grant has been received to fund final detailed design of a 30-meter optical and infrared telescope, using segmented mirrors and adaptive optics; this is 3 times the diameter of the current largest, the Keck Telescopes in Hawaii. Construction, which could complete as soon as 2012, is not yet funded.

The first 8-meter mirror was delivered to what will be the largest single optical telescope, the Large Binocular Telescope on Mount Graham in Arizona, using a 48-wheeled truck driving 1 mph up the winding gravel road to the mountain top. First light with one mirror is scheduled for 2004, and with both mirrors 2005.

The 2.2-meter University of Hawaii Telescope had first light with their new 16-megapixel infrared (IR) CCD, the world's most powerful IR imager. The first image was an impressive view of NGC 891, an edge-on galaxy popular with amateurs.



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