STARSCAN

Johnson Space Center Astronomical Society

VOLUME 20, NUMBER 11 November 2004

Cassini Visits Titan

IN THIS ISSUE

NASA News

Special Interest Groups

Club News, Features, and Information

Another Successful Astronomy Day

By Eleta Malewitz

Once again, Astronomy Day 2004 was a terrific success, in spite of intermittent light rain, high heat, and humidity. Crowds seemed thinner this year, perhaps scared off by the weather, but the preliminary headcount shows they were larger than they seemed. According to Barbara Wilson, "The park had 618 cars come through and several buses. One bus had 200 people on it. If there are 2 people per car then at least 1200 people at the minimum. That is my best estimate. But we know there were whole families that came in one car. almost 400 tickets were given out for the 36". It was very successful and my hat is off to all of you who did so much."

Bob Taylor & Chris Randall
(image by Randy Brewer)

We had a huge group of Cub Scouts (one of the buses, perhaps?) and lots of kids under 12, who don't have to pay to get into the park, and thus don't get counted. Most of the freebies got snapped up before the end of the day, and the few leftovers were donated to the George Observatory to use at their other outreach events, like the lunar eclipse viewing on October 27. Many thanks to Bill Leach for getting the plastic bags to hold all the give-aways this year. That helped keep the mess down so the cleanup crews didn't have to work so hard the next day.

NASA Moon Rock
(image by Ken Lester)

Also, many thanks to Bob Taylor and the others who provided canopies for the outdoor activities.
Having some of the kids' activities outside really helped keep the indoors less cramped.

Thanks also goes to Gary and P.J. Lofgren from the JSC Astromaterials Group, who brought the Moon Rock sample, and to all who helped provide security for it. This is one of two moon rocks they allow to go out on public display. Mary Lockwood provided a magnifying glass so people could see the sparkly grains of feldspar up close.

The two indoor talks I got to attend were both fascinating. The first was Gary Lofgren's talk on *What We Have Learned From the Lunar Samples*, about the storage facilities at JSC and how they study the returned samples from space missions. All future samples returned from various missions will be stored there, as well as meteorite samples from Antarctica and other finds. Much of the material is still in pristine condition, awaiting future methods of study that will tell us more than today's methods can.

Karen & Triple Nickel
(image by Randy Brewer)

The second talk by former astronaut Loren Shriver, now VP and Associate Program Manager for Exploration at United Space Alliance, was great, and well-attended. Col. Shriver gave a history of space flight, and then described his test flight experience and how it compared with flying the space shuttle. He com-

(Continued on page 4)

(Continued from page 3)

manded the mission that deployed the Hubble Space Telescope for the first time, so he feels that if the shuttle is safe to fly at all, it should be able to do a servicing mission, and if that's not safe, the shuttle isn't ready to fly safely yet. My sentiments exactly! He then talked about future exploration missions, such as the proposed ones to the Moon and Mars, and America's role in those missions. There should be some exciting times ahead for space exploration!

Dennis Webb explains CCD imaging
(Image by Ken Lester)

Many thanks to everyone who pitched in and worked so hard on all the outdoor talks and indoor displays, as well as the indoor talks, and to Stephanie Shipp and Mike Madera of LPI for bringing their kids' activities to Astronomy Day. Everyone's hard work contributed to a very successful event! We continue to learn what works and what doesn't, to make the subsequent years' events run more smoothly.

Lisa Lester at the Children's Activities Table
(image by Chris Randall)

Good news from Astronomy Day Chairman Bill Leach: according to the latest figures, income exceeded expenses by some $94 and change, which will go toward reserving a room for next year's Regional Meeting. As Bill said at the end of this year's A-Day, "This was fun. Let's do it again next year."

Eleta Malewitz mans the JSCAS table
(image by Chris Randall)

(L-R) Karen and Stephanie Taylor,
Dolly and Randy Brewer

Outdoor Presenters (L) Hernan Contreras and (R) Ed Malewitz (images by Chris Randall)

VISITING FORT MCKAVETT FOR A STAR PARTY

Al Kelly

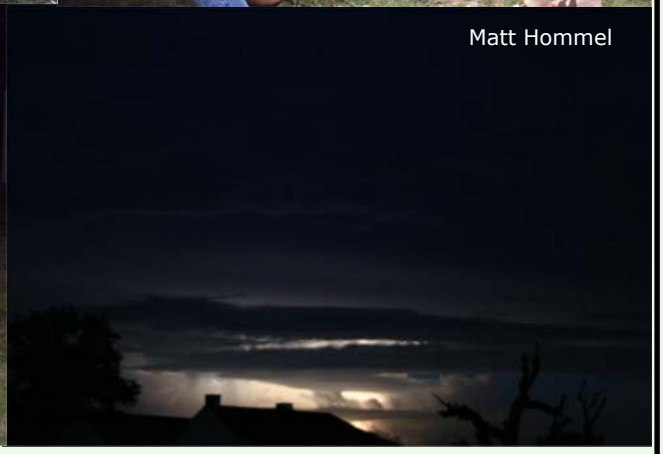
Entering the history of Commancheria, Texas while visiting a star party is an exercise in opposites, a mixture of earthbound introspection and cosmic mind release. The same stars have shown over Fort McKavett since its construction a century and a half ago, but our perception and understanding of them has undergone a massive metamorphosis. The life and times of the citizens in the area of the Fort have changed at least as greatly.

Demographic, political, and technological winds have swept the Fort, leaving its crumbled and reconstructed remains a study in time and a lesson in perspective. It once stood as an outpost against a native Commanche culture seen as essentially inhuman by the Anglo settlers. The Commanches saw the intruders in at least as low a light. There was evidence for both views, just as evidence for epicycles or for Copernicus' Sun-centered universe now supports a much different understanding of the cosmos. A day of immersion in the history and the natural seclusion of west-central Texas, followed by a night under a clear, dark sky of viewing historical photons from star-flung places is a mental massage.


Ken Lester


Ken Lester


Ken Lester


Matt Hommel


Randy Brewer

Antonin Rukl's "Atlas of the Moon" is being reprinted. This must have book for Lunar observers has been out of print for several years. It will be available from Sky and Telescope in mid-November.

Lunar Eclipse at LPI

Ken Lester

This month's Family Space Day at LPI was held during the lunar eclipse on Wednesday, October 27th. There was a wide variety of binoculars and telescopes in the field to the west of the building. Matt Hommel filmed the eclipse through his telescope which in turn was projected on the wall of the building. Lisa Lester counted over 168 people who viewed through her scope. All the scopes were busy most of the evening. Inside, LPI had its portable planetarium going along with activities for the kids.

The staff at LPI was very grateful for our assistance. Thanks go out to Ed and Eleta Malewitz, Bob Taylor, Hernan Contreras, Karen and Triple Nickel, Chris Randall, Matt and Lisa Hommel, John Gorduke, and Drell Setzer for there support of this event. I'm sure I've left some other participants off this list, if so, I apologize for my poor memory.

The eclipse was one of the best I've seen. Some early clouds blocked the Moon before it entered the umbra. However, the Moon rose above the clouds before the action really started. The Moon was a nice red color during totality. All images by Ken Lester.

(Clockwise from upper left) A visitor views the Moon, Eleta Malewitz, Hernan Contreras, our LPI hosts Mike and Allen, Karen Nickel, Bob Taylor (r) and John Gorduke (l), Drell Setzer.

David Nagler Tours NASA Aircraft

Televue Optics own David Nagler was recently in town where he took up Triple Nickel's long standing offer to tour the NASA aircraft. The tour included the Super Guppy, the G-1 executive aircraft, the T-38, and the G-2 Shuttle Trainer. Club president Bob Taylor and members Randy Brewer and Ken Lester accompanied Triple and David on the tour. Posted here are two images from David's tour.

(L) David Nagler at the helm of the Super Guppy; (R) Bob, Ken, David, Triple and the Super Guppy.

32" Telescope Update

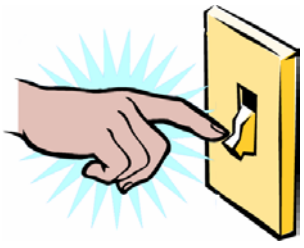
Dear JSCAS Friends,

Well, I'm back to first base on the Danciger 32". The deal with the Bay Area Council of the BSA for housing the scope at Camp Karankawa has fallen through. Apparently, some of the folks on the board are concerned that they would build a building and not have the scope forever....this, after I had told them from the very beginning that I was not GIVING the scope to them but would agree to leave it there for an agreed-upon period of years (at least 10 years was my starting position) and would donate my time for training and M&O of the scope. I also told them that if things went well, it may very well be there in perpetuity; but I guess that possibility was not good enough. Some of them recognize how special and unique this would be for a BS camp, but I guess others are always just looking for something (no matter how special) for next to nothing (relatively). I can't deal with folks like that.

Al Kelly

Help turn off the lights...

Join the
International Dark-Sky Association (IDA)
http://www.darksky.org
"To preserve and protect the nighttime environment and our heritage of dark skies through quality outdoor lighting."



Charlie's Challenge

Charles Hudson

THIS MONTH'S CHALLENGE

I recently attended a seminar in which the scientist described some experiments he had done determining the temperature dependence of some properties of a sub-cellular organelle. He had to use a microscope for this, and he said the experiments were "extremely difficult to perform", because as he raised the temperature of the Petri dish, water condensed on the objective lens of his microscope.

Science Stumper #68: What advice can you offer the scientist?

Answer will be published in the December issue.

SEPTEMBER'S CHALLENGE

Science Stumper #67: Why is the output of an incandescent bulb excessive in the red and deficient in the blue?

Answer: The color balance of any object that shines by being hot, like an incandescent bulb or a star, depends on the temperature of the emitter. The cooler a body is, the longer the wavelength of maximum emission. Ideally, an object will be photographed in sunlight and the slide would be illuminated by a source the same temperature as the sun, 5700 K. However, only a few substances remain solid at this temperature. They all lose mechanical strength when heated, and some of the most refractory, such a hafnium carbide, don't conduct well enough at room temperature to serve as a bulb element. Consequently, all incandescent sources are cooler than the sun. Tungsten, which is the highest melting metal, is the usual bulb filament and it melts at 3683 K. Because of the limited strength of the metal near the melting point, the actual temperature of operation of incandescent bulbs is about 3200 K. Since this is colder than the sun, the maximum of emission is actually in the infrared, and the proportion of red to blue is higher than that emitted by the sun.

This will be the last Charlie's Challenge for a while. If the membership wants it back, perhaps it can be resurrected in the future. But I will be unable to generate them in the immediate future.

— Charlie Hudson

JSCAS is grateful to Charlie for his thought provoking challenges. Your Science Stumpers will be missed.

— Ken Lester, Starscan Editor

Upcoming Events

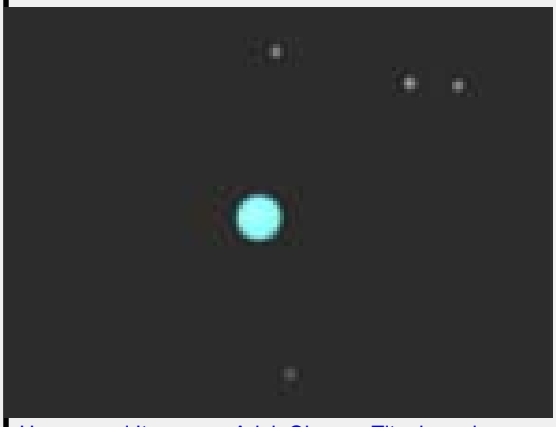
Moody Gardens Star Party: JSCAS will hold its last Moody Gardens star party for the year on November 6th. We will be at our new observing site near the hotel.

Haak Winery Star Party: We will once again set up in the vineyards of the Haak Winery for a star party on November 13th. The Haak star parties are very well attended by the public and are lots of fun.

Request for Observations

-- Rick Fienberg
Editor in Chief, Sky & Telescope
Chair, AAS Working Group for
Professional-Amateur Collaborations

Uranus, whose spin axis is tipped nearly parallel to its orbital plane, alternately turns one pole, then the other, toward Earth as it circles the Sun every 84 years. For the last several decades, Uranus's southern hemisphere has been tipped our way. In 2007 we'll have an equator-on view, and for several decades after that we'll see mostly the northern hemisphere. The last time we had a good equator-on view -- enabling us to observe the whole planet from pole to pole as it rotates once every 18 hours -- was several decades ago. Back then the telescopes, cameras, and techniques available to amateur astronomers were nowhere near as sophisticated as they are today. Thus backyard observers and astrophotographers have an unprecedented opportunity to contribute to professionals' studies of Uranus over the next few years.



Uranus and Its moons Ariel, Oberon, Titania and Umbriel ©Ed Grafton

In a typical backyard telescope, Uranus appears at first glance as a bland blue-green orb surrounded by a few faint moons. But if you look carefully or obtain high-resolution images, you may detect clouds or other features in the planet's atmosphere. Planetary scientist Heidi Hammel (Space Science Institute) is requesting amateur observations and images of Uranus to help identify discrete features in the planet's cloudtops and/or to note any significant changes in the planet's appearance.

Hammel notes that in red light, Uranus exhibits a bright band -- a polar "collar" -- encircling the south pole. You can see it in Hubble Space Telescope images shot over the past decade:

http://hubblesite.org/newscenter/newsdesk/archive/releases/category/solar%20system/uranus/

In blue light, the polar collar appears as a dark band instead. As we get closer to the equator-on view that's coming in 2007, we'll see less and less of the south polar collar; the planet's south polar region won't look as bright in red light or as dark in blue light as it has in recent years. You should expect to see this, so don't be surprised if it happens. It is a natural consequence of the change in viewing geometry and is not of any particular scientific interest.

What will be more interesting is if visual observers and/or astrophotographers start to pick up discrete features (clouds) or evidence for the formation of a polar collar in the planet's northern hemisphere.

Note that discrete features will be believable only if they are recorded by more than one observer and/or if they are seen to move across Uranus's disk as the planet rotates. Likewise, confirmation of a north polar collar will require multiple observations.

Near-infrared images made with one of the 10-meter Keck telescopes in Hawaii show extensive activity at the same latitude in the north where the polar collar appears in the south, suggesting that a polar collar is indeed beginning to develop in the north. Perhaps it will grow bright enough, or sink

(Continued on page 11)

(Continued from page 10)
low enough in the atmosphere, to become visible in backyard telescopes. (Observations at near-IR wavelengths are sensitive to clouds at higher altitudes than those made at visible wavelengths.)

Experienced planetary observers and imagers are encouraged to keep watch for discrete features and/or the formation of a north polar collar on Uranus. Please keep in mind the caveats noted above about confirming the features via multiple observations and/or planetary rotation -- it is easy to be tricked into thinking you've found something that isn't there if all you have is a single observation or picture.

Reports of interesting features and/or activity that changes the telescopic appearance of Uranus should be sent by e-mail to Richard Schmude, Remote Planets Coordinator for the Association of Lunar and Planetary Observers (ALPO). His e-mail address is schmude@gdn.edu.

Please make sure your report indicates the equipment used and the dates and times (including time zone) of your observations or images. If you're capturing images, the best way to note the orientation of Uranus is to take one image that shows the moons swarming around the planet, followed immediately by a closeup of Uranus itself -- without rotating the camera between exposures. Take care not to overprocess your images; the less sharpening and colorizing, the better. And if you use any filters with your eyepiece or camera, please note the wavelengths they transmit.

Uranus spends 2004 in Aquarius. A finder chart appeared on page 107 of the April 2004 issue of Sky & Telescope and is available on the magazine's Web site:

http://SkyandTelescope.com/observing/objects/planets/article_1221_1.asp

You can get a detailed physical ephemeris for Uranus, one that specifies the orientation of its equatorial plane with respect to Earth as well as the positions of its brightest satellites for any date and time, from NASA's Ames Research Center:

http://ringmaster.arc.nasa.gov/tools/ephem2_ura.html

Thanks, good luck, and clear skies!

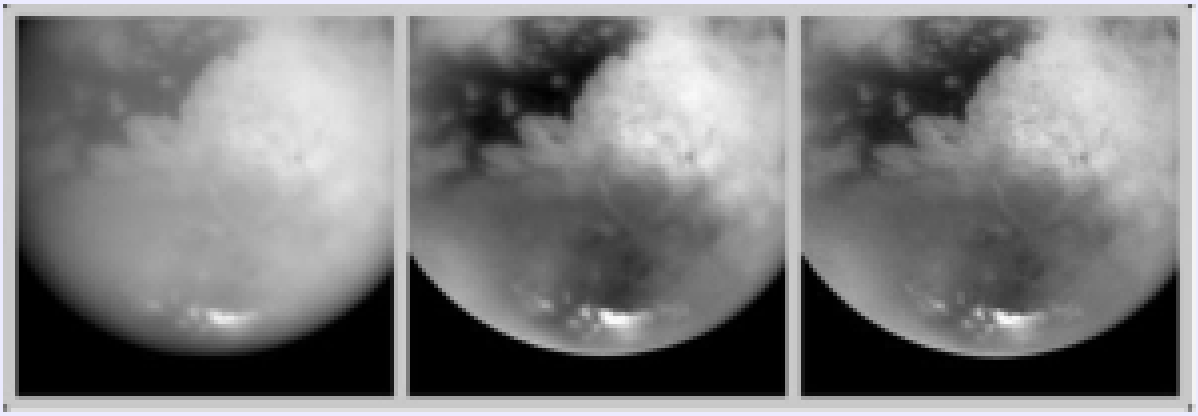
Houston Area Astronomy Clubs

Brazosport Astronomy Club
Meets the Third Tuesday of the month, 7:45 p.m.
At the Planetarium
400 College Drive
Clute, Texas
For more information, contact Judi James at the Planetarium
979-265-3376

Fort Bend Astronomy Club http://www.fbac.org/
Meets the third Friday of the month, 7:00 p.m.
First Colony Conference Center
3232 Austin Pkwy
Sugar Land, Texas

Houston Astronomical Society http://spacibm.rice.edu/~has/
Meets the first Friday of the month, 8:00 p.m.
University of Houston, University Park
Science and Research Building, room 117

North Houston Astronomy Club http://www.astronomyclub.org/
Meets the fourth Friday of the month, 7:30 p.m.
In the Teaching Theater at Kingwood College
20000 Kingwood Drive
Kingwood, Texas



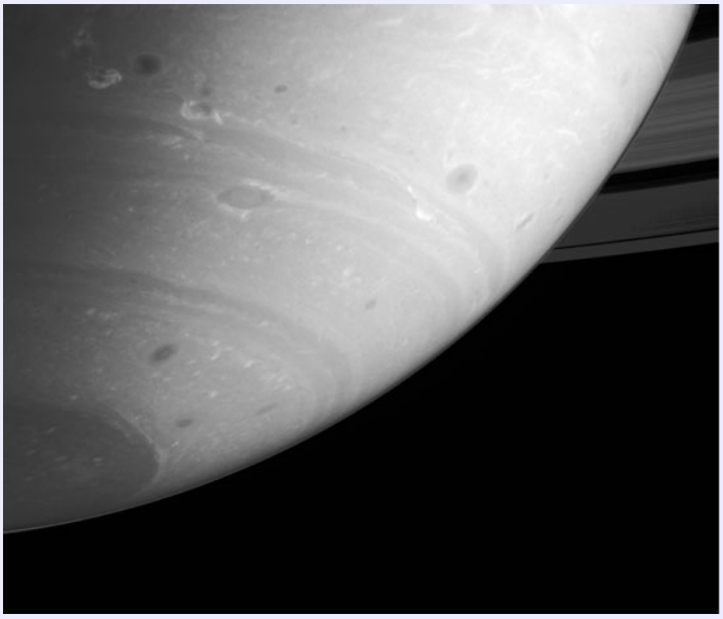
These three pictures were created from a sequence of images acquired by Cassini's imaging science subsystem on Oct. 25, 2004, 38 hours before its closest approach to Titan. They illustrate how the details of Titan's surface can be revealed through image processing techniques.

The picture on the left is a single image that has undergone only basic cleaning of corrupted pixels and imperfections in the camera's charge coupled device, a light-sensitive detector similar to those found in digital cameras. In the middle frame, multiple images were used to enhance the contrast detected from Titan's surface and to reduce the blurring effect of atmospheric haze. The picture on the right has been further processed to sharpen the edges of features.

Cassini-Huygens Images

Images and captions courtesy of NASA/JPL-Caltech

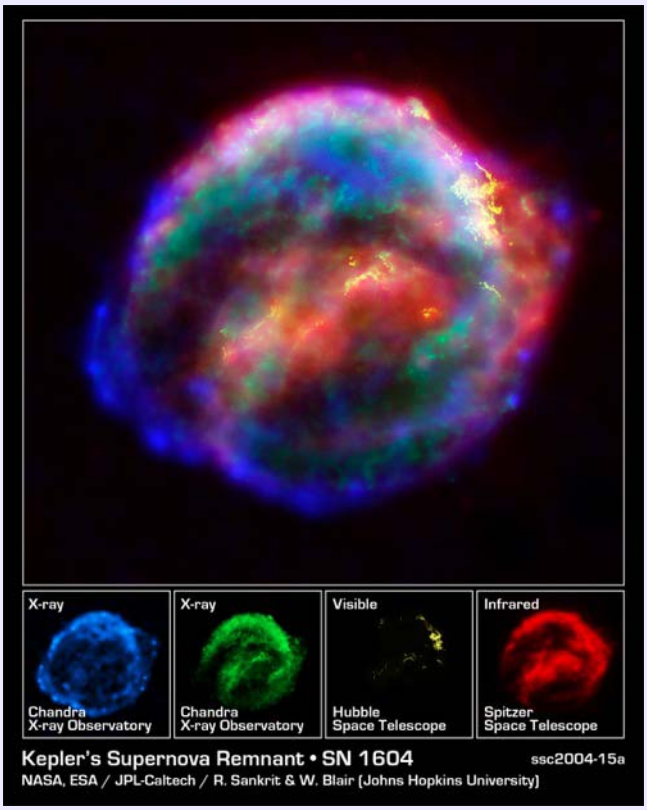
This stunning Cassini image shows that Saturn's atmosphere is an active and dynamic place, full of storms and powerful winds. This view is of the planet's southern hemisphere and shows dark storms ringed by bright clouds. The line along the limb of the planet is an artifact of the contrast-enhancement used to bring out features in the atmosphere.



The white churning clouds are at a latitude where winds blow to the west – one of the few such places on Saturn. This latitude has been active since the beginning of 2004 and has been informally named "Storm Alley" by Cassini imaging scientists.

The image was taken with the Cassini spacecraft narrow angle camera on Sept. 19, 2004, at a distance of 8.3 million kilometers (5.2 million miles) from Saturn through a filter sensitive to wavelengths of infrared light centered at 750 nanometers. The image scale is 49 kilometers (30 miles) per pixel.

Great Observatories May Unravel 400-Year-Old Supernova Mystery



For Release: October 6, 2004

Four hundred years ago, sky watchers, including the famous astronomer Johannes Kepler, best known as the discoverer of the laws of planetary motion, were startled by the sudden appearance of a "new star" in the western sky, rivaling the brilliance of the nearby planets.

Modern astronomers, using NASA's three orbiting Great Observatories, are unraveling the mysteries of the expanding remains of Kepler's supernova, the last such object seen to explode in our Milky Way galaxy.

When a new star appeared Oct. 9, 1604, observers could use only their eyes to study it. The telescope would not be invented for another four years. A team of modern astronomers has the combined abilities of NASA's Great Observatories, the Spitzer Space Telescope, Hubble Space Telescope and Chandra X-ray Observatory, to analyze the remains in infrared radiation, visible light, and X-rays. Ravi Sankrit and William Blair of the Johns Hopkins University in Baltimore lead the team.

The combined image unveils a bubble-shaped shroud of gas and dust, 14 light-years wide and expanding at 6 million kilometers per hour (4 million mph). Observations from each telescope highlight distinct features of the supernova, a fast-moving shell of iron-rich material, surrounded by an expanding shock wave sweeping up interstellar gas and dust.

"Multi-wavelength studies are absolutely essential for putting together a complete picture of how supernova remnants evolve," Sankrit said. Sankrit is an associate research scientist, Center for Astrophysical Sciences at Hopkins and lead for Hubble astronomer observations.

"For instance, the infrared data are dominated by heated interstellar dust, while optical and X-ray observations sample different temperatures of gas," Blair added. Blair is a research professor, Physics and Astronomy Department at Hopkins and lead astronomer for Spitzer observations. "A range of observations is needed to help us understand the complex relationship that exists among the various components," Blair said.

The explosion of a star is a catastrophic event. The blast rips the star apart and unleashes a roughly spherical shock wave that expands outward at more than 35 million kilometers per hour (22 million mph) like an interstellar tsunami. The shock wave spreads out into surrounding space, sweeping up any tenuous interstellar gas and dust into an expanding shell. The stellar ejecta from the explosion initially trail behind the shock wave. It eventually catches up with the inner edge of the shell and is

(Continued on page 14)

(Continued from page 13)
heated to X-ray temperatures.

Visible-light images from Hubble's Advanced Camera for Surveys reveal where the supernova shock wave is slamming into the densest regions of surrounding gas. The bright glowing knots are dense clumps that form behind the shock wave. Sankrit and Blair compared their Hubble observations with those taken with ground-based telescopes to obtain a more accurate distance to the supernova remnant of about 13,000 light-years.

The astronomers used Spitzer to probe for material that radiates in infrared light, which shows heated microscopic dust particles that have been swept up by the supernova shock wave. Spitzer is sensitive enough to detect both the densest regions seen by Hubble and the entire expanding shock wave, a spherical cloud of material. Instruments on Spitzer also reveal information about the chemical composition and physical environment of the expanding clouds of gas and dust ejected into space. This dust is similar to dust which was part of the cloud of dust and gas that formed the Sun and planets in our solar system.

The Chandra X-ray data show regions of very hot gas. The hottest gas, higher-energy X-rays, is located primarily in the regions directly behind the shock front. These regions also show up in the Hubble observations and also align with the faint rim of material seen in the Spitzer data. Cooler X-ray gas, lower-energy X-rays, resides in a thick interior shell and marks the location of the material expelled from the exploded star.

There have been six known supernovas in our Milky Way over the past 1,000 years. Kepler's is the only one for which astronomers do not know what type of star exploded. By combining information from all three Great Observatories, astronomers may find the clues they need. "It's really a situation where the total is greater than the sum of the parts," Blair said. "When the analysis is complete, we will be able to answer several questions about this enigmatic object."

Images and additional information are available at:
http://www.nasa.gov
http://hubblesite.org/news/2004/29
http://chandra.harvard.edu
http://spitzer.caltech.edu
http://www.jhu.edu/news_info/news/
http://heritage.stsci.edu/2004/29
http://www.nasa.gov/vision/universe/starsgalaxies/kepler.html.

Gay Yee Hill
Spitzer Science Center, Pasadena, Calif.

Donald Savage
Headquarters, Washington

Megan Watzke
Chandra X-ray Observatory Center, CfA, Cambridge, Mass.

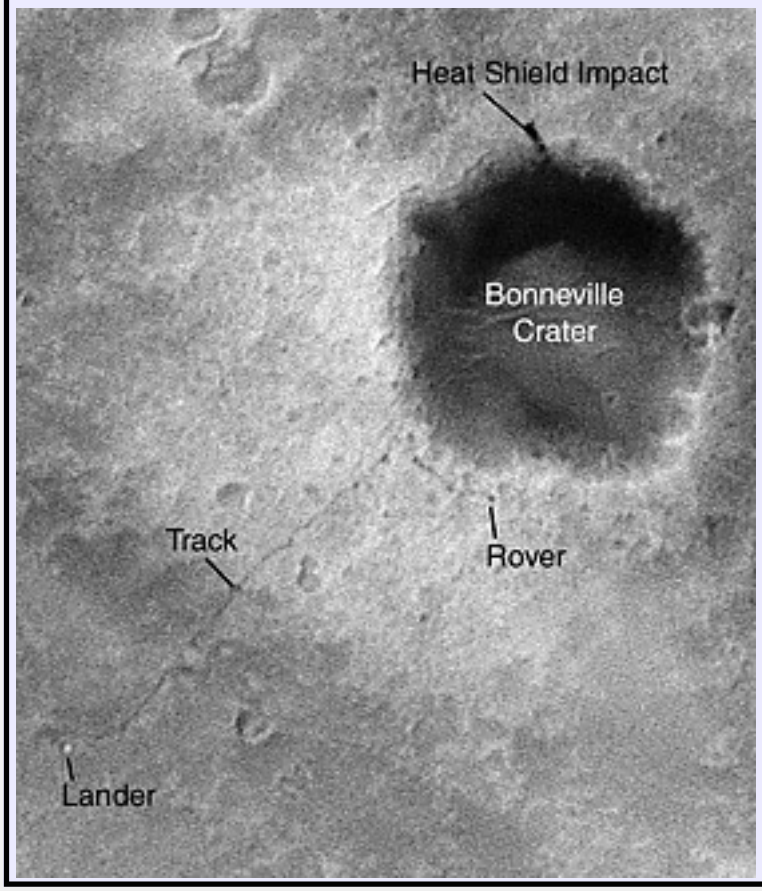
Donna Weaver
Space Telescope Science Institute, Baltimore

jpl2004-250
ssc2004-15

MARS ORBITER SEES ROVER TRACKS

Excerpts from IMAGE ADVISORY: 2004-238 September 27, 2004

NASA's Mars Global Surveyor, starting its third mission extension this week after seven years of orbiting Mars, is using an innovative technique to capture pictures even sharper than most of the more than 170,000 it has already produced.



One dramatic example from the spacecraft's Mars Orbiter Camera shows wheel tracks of NASA's Mars Exploration Rover Spirit and the rover itself.

"Over the past year and a half, the camera and spacecraft teams for Mars Global Surveyor have worked together to develop a technique that allows us to roll the entire spacecraft so that the camera can be scanned in a way that sees details at three times higher resolution than we normally get," said Dr. Ken Edgett, staff scientist for Malin Space Science Systems, San Diego, Calif., which built and operates the Mars Orbiter Camera. The technique adjusts the rotation rate of the spacecraft to match the ground speed under the camera.

"The image motion compensation is tricky and the spacecraft does not always hit its target. However, when it does, the results can be spectacu-

Sky & Telescope and now Astronomy Magazine Subscriptions – Don't Forget about the Club Discount!

Sky & Telescope offers a "Club Discount" on subscriptions. You can subscribe to Sky and Telescope for $10 off the normal price ($32.95 with the club discount). Astronomy magazine is also offering a club discount. JSCAS members can subscribe to Astronomy for $29 a year. We need to have a minimum of five subscribers to take advantage of the discount. I need **four** more people to sign up. If you are a current subscriber, *please* contact me so I can put you on the list for the club discount when your subscription is due for renewal!

Contact me by the email listed on the JSCAS web site, catch me at a meeting, or send your check and renewal form to my home address: 2407 Elkton Ct., Pearland, TX, 77584. I'll put your renewal in the mail within 48 hours after I receive it.

David Haviland
Vice-president and Secretary

Astronomy 101 — "Little Clouds"

Astronomy Basics

Ken Lester

Long before Galileo, ancient Greek and Latin astronomers had identified several **nepheloeides** or "cloudy spots" in the night sky. The word **nebula** was derived from the Latin word for "mist" or "vapor", which was derived from the Greek word **nephelion** or "little cloud".

Ptolemy (85 A.D. - 165 A.D.), listed seven nebulous objects in his *Megale Syntaxas tes Astronomias* better known as, *Almagest*. Three of the objects are asterisms, but the other four are true deep sky objects. Two of them, the Praesepe (M44) and the Double Cluster (h and Chi in Perseus), had been catalogued by Hipparchus in 130 B.C., but the other two were new: the Coma Berenices Star Cluster (Mel 111) and "a nebula behind the sting of Scorpius", (M7). J.E. Gore (1845—1910) mentions that M41 was "possibly" recorded by Aristotle about 325 B.C. Surprisingly, the Andromeda Galaxy was not mentioned until 946 A.D. by the Arabian astronomer Al Sufi in his *Description of the Fixed Stars*.

After astronomers began using telescopes, they found many more fuzzy objects, all of which were considered nebulae. As telescope size and quality increased, many of these nebulous objects were determined to be distant groups of stars. In fact, all those recorded by Ptolemy, Hipparchus and Aristotle are star clusters. In the mid 19th century, Lord Rosse discovered "spiral nebulae". In the early 1920s Edwin Hubble discovered Cepheid variables in the Andromeda Spiral Nebula M31 and in the Triangulum Spiral Nebula M33, proving that these "spiral nebulae" are in fact extragalactic star systems. Henceforth, the term nebula has been reserved for clouds of dust and gas.

True nebulae are of two basic types: dark and bright. Bright nebulae shine either by their own fluorescence or by reflected light. Dark nebulae can be seen only because they happen to be silhouetted against a luminous background.

Dark Nebula

When clouds of interstellar dust and gas, composed of light absorbing materials such as ice, graphite, silicate, and molecular hydrogen, lie between the observer and bright nebulae or the Milky Way itself, the silhouette becomes a dark nebula. The density of these clouds is low. The darkness of the nebula isn't so much a function of the clouds density but of the thickness of the cloud. Dark nebulae are not truly opaque. Some light does get through. To observe dark nebula, use the lowest possible magnification to increase the contrast between the nebula and its background.

One of the most famous dark nebulae is the Horse Head nebula in Orion (B33). To observe the Horse Head, use a hydrogen beta filter to enhance the emission nebula IC434 behind the Horse Head. UHC and HIII filters are other filters that can be used to enhance the contract between dark nebulae and emission nebulae backgrounds.

Horse Head nebula — ©Al Kelly

(Continued on page 17)

(Continued from page 16)

Reflection Nebula

These are nebulae which shine by light reflected by nearby stars, much as our Moon shines by the Sun's reflected light. Reflection nebula are composed of the same materials as dark nebula. The dust grains in a reflection nebula scatters blue light and stars seen through the nebula often appear redder because of their blue light is scattered. The nebula around Merope in the Pleiades (M45) is an example of a reflection nebulae. Reflection nebulae cannot be enhanced by OIII and H-alpha filters, but might be enhanced some by light pollution filters.


M45 ©Glenn Ray

Emission Nebula

Emission nebulae are giant clouds of glowing ionized gas. These nebulae are always around or near hot O and early B type stars because it is the large amounts of ultraviolet radiation from these stars which causes the atoms in the nebula to ionize. H-alpha filters and usually OIII filters will enhance the view of emission nebulae. The Great Orion Nebula (M42) is an excellent example of an emission nebula.


M42 ©Shane Ramotowski

Planetary Nebula

As described in *The Night Sky Observer's Guide*, "Planetary nebulae are…the death shrouds of highly evolved asymptotic branch red giants in which the mechanism of atmospheric pulsations got out of hand and the star's outer layers reached escape velocity". The Helix Nebula (NGC 7293) measuring 16' x 12', about half the diameter of the Moon, has such a low surface brightness that it is necessary to use very low power to be able to observe it. The Ring Nebula (M57) is a favorite planetary target of amateur astronomers.


Ghost of Jupiter ©Al Kelly

Supernova Remnants (SNRs)

SNRs are expanding clouds of debris from supernova explosions. The crab Nebula (M1) and the Veil Nebula (NGC 6960, NGC 6974, NGC 6979, NGC 6992, and NGC 6995) are excellent examples of supernova remnants. The use of an OIII filter should aid in the hunt for SNRs.


Veil Nebula (NGC6960) ©Al Kelly

References

For more information about nebulae please reference the following sources:

http://seds.lpl.arizona.edu/messier/xtra/Bios/ptolemy.html
http://www-groups.dcs.st-and.ac.uk/~history/Mathematicians/Hipparchus.html
Keppel, George and Sannar, Glenn, *The Night Sky Observer's Guide*, Willmann-Bell, 1998

Visual Observing for November 2004

Chris Randall

★**SSO**: (Solar System Objects) Summary for the 15 November 04

Object	Const	Mag	% Ill	Rise Time	Transient	Set Time
Sun	Lib	-26.7	100	06:45	12:04	17:24
Moon	Sgr	----	17	10:19	15:20	20:21
Mercury	Oph	-.03	74	08:35	13:36	18:40
Venus	Vir	-4.0	84	04:19	10:04	15:50
Mars	Vir	1.7	99	05:11	10:45	16:19
Jupiter	Vir	-1.7	100	03:27	09:21	15:16
Saturn	Gem	0.5	100	21:47	04:38	11:29
Uranus	Aqr	5.8	100	13:23	19:03	00:39
Neptune	Cap	7.9	100	12:18	17:40	23:05
Pluto	Ser	14.0	99	08:36	14:02	19:33
204 Q2 Machholz	Col	7.1	93	21:05	01:51	06:36

Highlighted times denote daylight events.

★**BSO**: (Bright Sky Objects)
NGC 869 – Open Cluster in Perseus, Magnitude 5.3, Size 29', Stars 200.
NGC 884 - Open Cluster in Perseus, Magnitude 6.1, Size 29', Stars 150.
CR 463 – Open Cluster in Cassopia, Magnitude 5.7, Size 36', Stars 40.
Tr 2 (Cr 29) – Open Cluster in Perseus, Magnitude 5.9, Size 20', Stars 20.

★**DSO**: (Dark Sky Objects)
NGC 253 (C-65) – Galaxy in Sculptor, Magnitude 8.0(B), Size 28' x 7'.
SH2-155 (C-9) – Bright Nebula in Cepheus, Magnitude --, Size 14' x 11'
NGC 1068 (M 77) – Galaxy in Cetus, Magnitude 8.8, Size 7' x 6'.
NGC 1097 (C-67 Arp 77) – Galaxy in Fornax, Magnitude 9.2, Size 13' x 9'.

★**CDMP:** (Chris' Don't Miss Pick)
Andromeda Galaxy System NGC 224, NGC 221, NGC 205 (M 31, M 32, M 110)

The famous *Andromeda Galaxy*, is our nearest, large neighbor galaxy. It is a member of our Local Group of galaxies along with its companions M32 and M110, our Milky Way, M33, and others.

Visible to the naked eye, even under moderate conditions, this object was known as the "little cloud" to the Persian astronomer Abd-al-Rahman Al-Sufi, who described and depicted it in 964 A.D. in his *Book of Fixed Stars*: It was observed by, and commonly known to, Persian astronomers at Isfahan by 905 A.D., or earlier. R.H. Allen (1899/1963) reported that it was also appeared on a Dutch star map in 1500. Charles Messier, who cataloged it on August 3, 1764, was obviously unaware of these early reports, and attributed its discovery to Simon Marius. Marius was the first to give a telescopic description of it in 1612, but (according to R.H. Allen) didn't claim its discovery. Unaware of both Al

(Continued on page 19)

(Continued from page 18)
Sufi's and Marius' discovery, Giovanni Batista Hodierna independently rediscovered this object before 1654. Edmond Halley, however, in his 1716 treatise of *Nebulae*, attributes the discovery of this "nebula" to the French astronomer Bullialdus (Ismail Bouillaud), who observed it in 1661; but Bullialdus mentions that it had been seen 150 years earlier (in the early 1500s) by some anonymous astronomer (R.H. Allen, 1899/1963).

It was wrongly believed that the "Great Andromeda Nebula" was one of the nearest nebulae. William Herschel believed, wrongly of course, that its distance would "not exceed 2000 times the distance of Sirius" (17,000 light years). He viewed it as the nearest "island universe" like our Milky Way which he assumed to be a disk of 850 times the distance of Sirius in diameter, and of a thickness of 155 times that distance. It was William Huggins, the pioneer of spectroscopy, who noted in 1864 the difference between gaseous nebula with their line spectra and those "nebulae" with star-like, continuous spectra, which we now know as galaxies. He found a continuous spectrum for M31 (Huggins and Miller 1864).

In 1887, Isaac Roberts obtained the first photographs of the Andromeda "Nebula," which showed the basic features of its spiral structure for the first time. In 1923, Edwin Hubble found the first Cepheid variable in the Andromeda galaxy and thus established the intergalactic distance and the true nature of M31 as a galaxy. Because he was not aware of the two Cepheid classes, his distance was incorrect by a factor of more than two. This error was not discovered until 1953, when the 200-inch Palomar telescope was completed. Hubble published his epochal study of the Andromeda "nebula" as an extragalactic stellar system (galaxy) in 1929 (Hubble 1929).

In modern times, the Andromeda galaxy is certainly the most studied "external" galaxy. It is of particular interest because it allows studies of all the features of a galaxy that are hidden in our own galaxy by interstellar dust. Thus, there are continuous studies of the spiral structure, globular and open clusters, interstellar matter, planetary nebulae, supernova remnants (see e.g. Jeff Kanipe's article in *Astronomy*, November 1995, p. 46), galactic nucleus, companion galaxies, and more.

Some of the features mentioned above are also of interest for the amateur. Even Charles Messier observed its two brightest companions, M32 and M110 (which are visible in binoculars and conspicuous in small telescopes), creating a drawing of all three. These two relatively bright and close companions are visible in many photos of M31. They are only the brightest of a "swarm" of smaller companions which surround the Andromeda Galaxy, forming a subgroup of the Local Group. By September 2003, at least 11 of them are known. Besides M32 and M110 there are NGC 185, which was discovered by William Herschel, NGC 147 (discovered by d'Arrest) as well as the very faint dwarf systems And I, And II, And III, possibly And IV (which may be a cluster or a remote background galaxy), And V, And VI (also called the Pegasus dwarf), And VII (also known as the Cassiopeia dwarf), and And VIII. It is still not clear if M33, the smaller spiral galaxy in Triangulum, and its probable companion LGS 3, belong to this subgroup or the more remote Local Group member IC 1613, or one of the possible member candidates UGCA 86 or UGCA 92.

The Andromeda Galaxy is in notable interaction with its companion M32, which is apparently responsible for a considerable amount of disturbance in the spiral structure of M31. The arms of neutral hydrogen are displaced from those consisting of stars by 4000 light years, and cannot be continuously followed in the area closest to its smaller neighbor. Computer simulations have shown that the disturbances can be modeled by a recent close encounter with a small companion of the mass of M32. Very probably, M32 has also suffered from this encounter by losing many stars which are now spread in Andromeda's halo.

G1, the brightest globular cluster of the Andromeda Galaxy, is also the most luminous globular in the Local Group of Galaxies; its apparent visual brightness from Earth is still about magnitude 13.72.

(Continued on page 20)

(Continued from page 19)
It outshines even Omega Centauri, the brightest globular in our Milky Way, and can be glimpsed by better equipped amateurs under very favorable conditions with telescopes starting at 10-inch aperture. While the easiest, G1 is not the only M31 globular cluster which is in the reach of large amateur telescopes. Amateur Steve Gottlieb has observed 18 globular clusters of M31 with a 44cm telescope. Barmby *et.al* (1999) have found 435 globular cluster candidates in M31, and estimate the total number at 450 +/- 100.

The brightest star cloud in the Andromeda galaxy has been assigned its own NGC number: NGC 206. William Herschel had taken it into his catalog as H V.36 on the grounds of his discovery observation of October 17, 1786.

Despite the large amount of knowledge we now have about the Andromeda Galaxy, its distance is not really well known. While it is well established that M31 is about 15-16 times further away than the Large Magellanic Cloud (LMC), the absolute value of this measure is still uncertain. In current sources due to the uncertainty in the LMC distance, it is usually given between 2.4 and 2.9 million light-years. The semi-recent correction from data by ESA's astrometrical satellite Hipparcos has pushed this value up by more than 10 percent, from about 2.4-2.5 to the 2.9 million light-year value we use here.

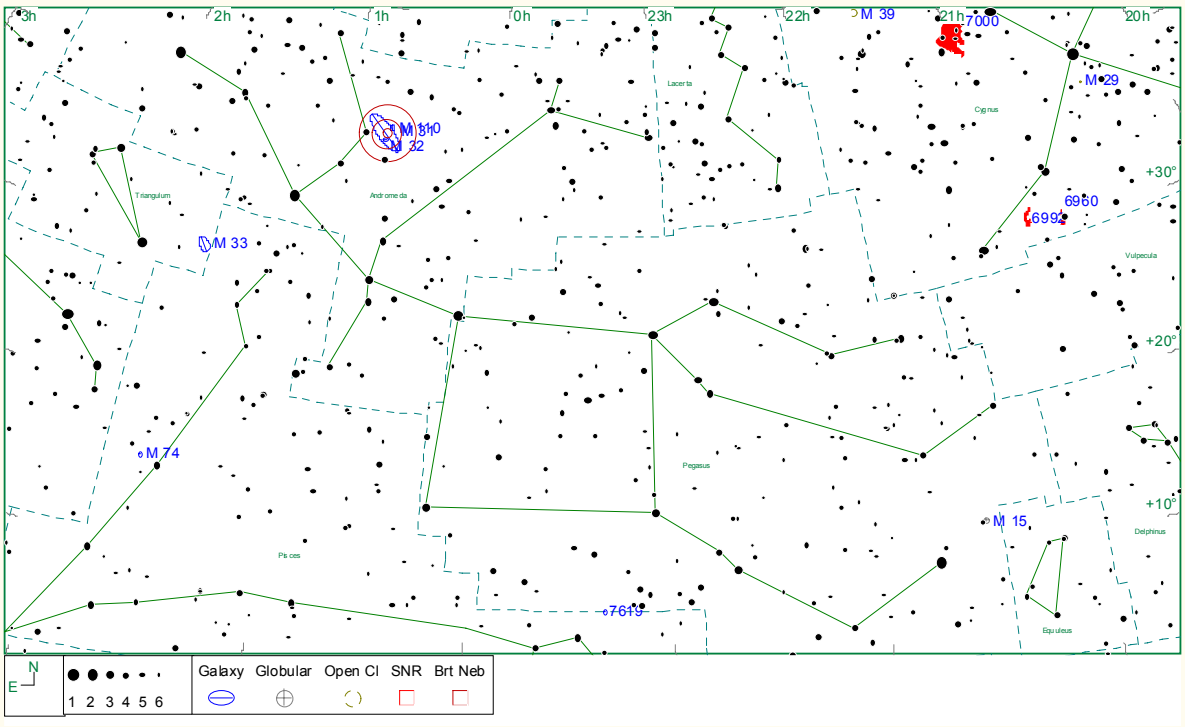
Under "normal" viewing conditions, the apparent size of the visible Andromeda Galaxy is about 3 x 1 degrees. Careful estimates of its angular diameter, performed with 2-inch binoculars, by the French astronomer Robert Jonckhere in 1952-1953, revealed an extension of 5.2 times 1.1 degrees (reported by Mallas), corresponding to a disk diameter of over 250,000 light years at its distance of 2.9 million light years. This makes the galaxy more than double the size of our own Milky Way galaxy! Its mass was estimated at 300 to 400 billion times that of the sun. Compared to the newer estimates for our Milky Way galaxy, this is considerably less than the mass of our galaxy, implying that the Milky Way may be much denser than M31. These results are confirmed by new estimates of the total halo masses, which turn out to be about 1.23 trillion solar masses for M31, compared to 1.9 trillion for the Milky Way (Evans and Wilkinson, 2000).

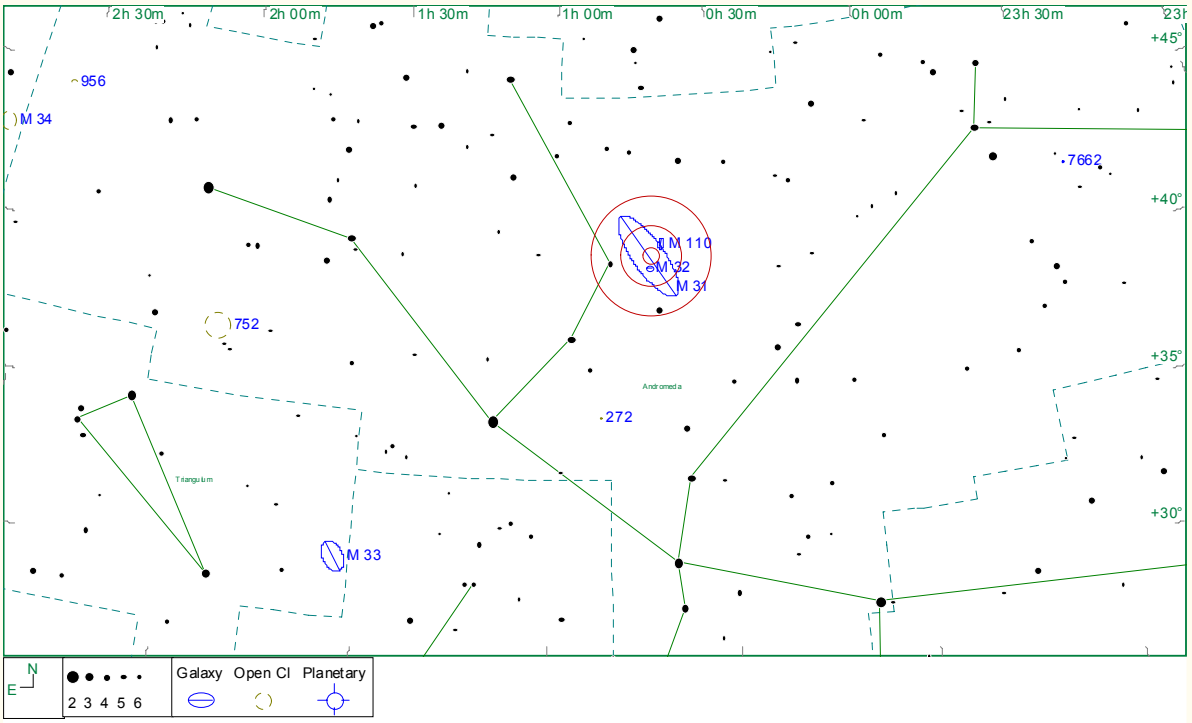
The Hubble Space Telescope has revealed that the Andromeda galaxy has a double nucleus. This suggests that either it has actually two bright nuclei, probably because it has "eaten" a smaller galaxy which once intruded its core, or parts of a single core are obscured by dark material, probably dust. In the first case, the second nucleus may be a remainder of a possibly violent dynamical encountering event in the earlier history of the Local Group. In the second case, the duplicity of Andromeda's nucleus would be an illusion causes by a dark dust cloud obstructing parts of a single nucleus in the center of M31.

Up to now, only one supernova has been recorded in the Andromeda galaxy: Supernova 1885, also designated S Andromedae. This was the first supernova discovered beyond our Milky Way galaxy. It was observed on August 20, 1885, by Ernst Hartwig (1851-1923) at Dorpat Observatory in Estonia. It reached magitude 6 between August 17 and 20, and was independently found by several other observers. However, only Hartwig realized its significance. It faded to magitude 16 in February 1890.

Great information on this region can be seen in Paul W. Hodge's *Atlas of the Andromeda Galaxy*: http:// nedwww.ipac.caltech.edu/level5/ANDROMEDA_Atlas/Hodge_contents.html

For More information go to http://www.seds.org/messier/m/m031.html


3h
2h
1h
0h
23h
22h
21h
20h
M 39
7000
M 29
Lacerta
Cygnus
M 110
M 32
Triangulum
Andromeda
M 33
6960
6992
+30°
Vulpecula
+20°
M 74
Pegasus
+10°
M 15
Delphinus
Pisces
7619
Equuleus
N
E
1 2 3 4 5 6
Galaxy
Globular
Open Cl
SNR
Brt Neb


2h 30m
2h 00m
1h 30m
1h 00m
0h 30m
0h 00m
23h 30m
23h
+45°
956
M 34
7662
+40°
M 110
M 32
M 31
752
Andromeda
272
+35°
Triangulum
+30°
M 33
N
E
2 3 4 5 6
Galaxy
Open Cl
Planetary

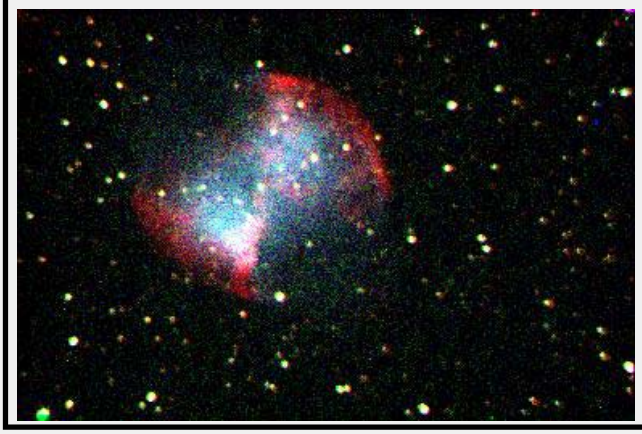
MEMBER'S GALLERY

NGC 7008
©Al Kelly

L/RGB image of the planetary nebula NGC 7008 in Cygnus. Taken with a Starlight Express MX916 and a 17.5" Newtonian on 10/15/04 from Friendswood, Texas, using Schuler RGcBc filters. Seven 120-second unfiltered sub-exposures, five 120-second sub-exposures in red, four 120-second sub-exposures in green, and five 120-second sub-exposures in blue were self-guided in Astroart and processed in AIP4WIN and Photoshop.

M103
©Al Kelly

L/RGB image of open cluster M103 in Cassiopeia, made from images taken with a Starlight Express MX916 and a 17.5" Newtonian on 10/15/04 from Friendswood, Texas, using Schuler RGcBc filters. Five 120-second sub-exposures in red, four 120-second sub-exposures in green, and five 120-second sub-exposures in blue were self-guided in Astroart and processed in AIP4WIN and Photoshop.



M27
Chris Wells

"Last night I played around for the 1st time with a CCD color filter and took the attached M27 picture. Since it was my 1st ever color attempt I thought I would share this. At this stage I have no idea how to process color images so processing was limited to manual alignment of RGB images and dark frame subtraction."

Lunar Eclipse
October 2004
©Becky Ramotowski

Just as the Moon was coming up a bunch of coyotes started yipping. Which got all the neighborhood dogs excited, and then they all started barking. It was quite a serenade for about 10 minutes. Then I guess they all settled down to watch the sky because it was very quiet for the entire event.

Lunar Eclipse
October 2004
©Randy Brewer

Lunar Eclipse
©Randy Brewer

Taken at 10:00 PM on 10/27/04 with a FCT-150 @ F/7 with a Canon 10D at prime focus.

Telescope Review — Meade DS90-AT.

Matt Hommel

I decided to purchase a starter scope for the younger stargazers in my family and after exhaustive research I came upon an unusually good deal. A deal which has only gotten better in the time that has passed since my purchase.

First let's begin with the Fluff — Oops, I mean history. In the late nineties Meade put out a 90mm refractor called the DS90-EC. This scope carried a street price of about $399.00 plus tax and shipping. Despite being Autostar ready, the scope did not include the Autostar and most people opted to shell out another $150 to get it. With an effective purchase price of around $550.00 the scope hit the streets to rave reviews. You can still find the reviews for the DS90-EC on *Cloudy Nights Telescope Reviews* (http://www.cloudynights.com/).

Once the production run of the DS90-EC had ended, Meade decided to pair the scope with its low end Autostar 494, and sell them at Sam's Club for $249.00. This was a good deal considering that it was the same scope (different Autostar) others had bought for $550.00.

Meade DS90-AT refractor

I took advantage of this offering and I was pleased with the views even with the less than acceptable .965 inch diameter eye-pieces. I quickly grew weary of the .965's and opted to exercise a fabulous feature of this scope that is rarely if ever found in starter scopes. This telescope can use 2 inch eyepieces in addition to 1.25 inch should you prefer those for whatever reason.

I upgraded the eyepiece to a 2 inch 42 mm wide field eyepiece that gives awesome views. I, of course, had to purchase a 2 inch diagonal and have Meade send me the adapter for free. I can now view 2.25 degrees of sky at once and that makes a huge difference. In addition to the features I have already mentioned you can also connect the telescope to your computer and drive it with software. The Autostar is so easy my 5 year old can use it without difficulty. The software is even easier to use although I should point out that a special cable is required.


Taken with DS90-AT using eyepiece projection. Image by Matt Hommel

I must say that I am very pleased with this scope. The mount is stable, the tracking and Go-To features are spot on and the views are excellent. The Andromeda galaxy has never looked better, the Double Cluster fills the eyepiece nicely, and the Moon is breathtaking. Now here's the good news: Sam's has started stocking the DS90-AT again and they are packaging it with the 1.25 inch eyepieces. The price has dropped to $199 plus tax. If you wish to upgrade you would still have to find all those

(Continued on page 25)

(Continued from page 24)
pieces.

I thought that it would be unfair to talk about how great I think this telescope is and then run the risk that none are available. To prevent that, I purchased a 90mm DS90-AT and an 80mm DS80-AT. You can find them listed in this issue of the Starscan under the *For Sale* heading. I have upgraded the 90mm with a 2" focuser. The 80mm can be upgraded but I wanted to offer an inexpensive telescope to anyone looking for a solid starter scope. I have trained and calibrated the motors on these scopes and configured the Autostars for the Houston area. They are ready to be stuffed under the Christmas tree or set out under the stars. I am selling these at my cost so I can't be accused of profiting from this review. My only desire is that someone's first telescope is a useful instrument that will bring him or her many hours of joy exploring the universe.

For Sale

Meade DS80-AT refractor

Meade DS90-AT refractor

Meade DS90-AT with Autostar $299
Includes 2" diagonal, a 2" 42mm eyepiece which yields a 68° field of view
120 V A/C or battery operated

Meade DS80-AT with Autostar $129
Includes three .965 eyepieces: 4 mm, 12.5 mm and 25 mm
It has some slight blemishes, mainly a crack in the dew shield. I will be glad to upgrade it at cost but I wanted to make it as inexpensive as possible.

If anyone decides they don't like the scope in the first 30 days they can return it in the shape it was sold and I will take it back for a full refund.

Please contact Matt Hommel at mhommel@houston.rr.com

New Product

Hi folks,

At our last meeting I passed around a flashlight that had a built-in generator and cell phone charging adapters. For anyone interested, here is the website: http://www.everlastingflashlight.com/

Bob Taylor

Johnson Space Center Astronomical Society

An association of amateur astronomers dedicated to the study and enjoyment of astronomy. Membership is open to anyone wishing to learn about astronomy.

OFFICERS

President
Bob Taylor
Vice President
David Haviland
Secretary
To be announced
Starscan Editor
Ken Lester
Star Party Chairperson
Lisa Lester
Librarian
Lisa Lester
Historian
Susan DeChellis
Scientific Expeditions
Paul Maley
Web Master
Chris Randall

SIGS

Observing Awards
Triple Nickel
CCD Imaging
Al Kelly
Binocular Observing
Leslie Eaton
Telescope Making
Bob Taylor
Deep Sky Observing
Chris Randall

November Meeting Agenda

November 12th. Center for Advanced Space Studies/Lunar Planetary Institute, 3600 Bay Area Blvd. (at Middlebrook Drive).

7:30	Meeting start and welcome
7:40	Presentation— *Singularity* world-premiere reading and discussion by the author Bill DeSmedt.
8:30	Break
8:45	Calendar review, presentations, and awards
8:50	Star Party Announcements, Lisa Lester
9:10	Deep Sky Observing, Chris Randall
9:30	Astronomical Oddities, Hernan Contreras
9:40	Charlies Challenge, Charles Hudson
9:50	Door Prizes

Starscan Submission Procedures

Original articles of astronomical interest will be accepted up to 6 P.M. November 25th.

The most convenient way to submit articles or a Calendar of Events is by electronic mail, however computer diskettes or CDs will also be accepted. All articles should include author's name and phone number. Also include any picture credits. The recommended format is Microsoft Word. Text files will also be accepted.

Submitter bears all responsibility for the publishing of any e-mail addresses in the article on the World Wide Web.

Editor's electronic address is: lesteke@swbell.net. Be sure to include the word Starscan in the subject line for proper routing of your message.

Starscan Staff

Editor	Assistant Editors
Ken Lester	Sheila Steele
	Ken Steele

Cover Image by NASA/JPL-Caltec

Composite of an image of Saturn, taken by Voyager 2 on August 4, 1981 and a false color image of Titan taken on October 26, 2004 by the Cassini-Huygens space craft.