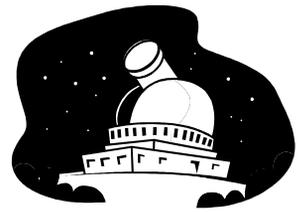




SKYWATCHER

THE NEWS LETTER OF THE GUILDFORD
ASTRONOMICAL SOCIETY



<http://www.guildfordas.org/>

FROM THE EDITOR.....

Happy New Year everyone, and I hope you all had a great Christmas and got all the goodies you asked for

Well a new year is here now, and with that a new idea, for those of you at the last meeting, I briefly spoke about an idea that I was going to start in Skywatcher, well here it is.....

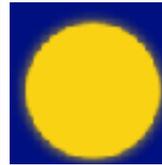
All you have to do is write a small article on the subject that I (or anyone who wants to suggest a topic) choose, you can write about the things you like or dislike about the chosen subject, its entirely up to you. There are no rules, other than that all entries must be in by the set closing date, and no more than 150 words if possible, photos are aloud but please keep it to as few as possible, and that is basically it.

So for the first topic, I will keep it easy, lets start with **ASTRONOMY**

Closing date is the 25th Feb, so that's just over 2 weeks, I'm sorry to say that there are NO prizes up for grabs, but the best 1 will be placed hopefully on the web site and a few of the rest will go into the following issue of Skywatcher with the winner? GOOD LUCK!

Well that's it from me for now, other than to wish you all clear skies.

Neil Ross
Editor



British Astronomical Association

70 Years A Member

On Saturday 18th December the Association marked Sir Patrick Moore's 70 years of membership. Sir Patrick was presented with an Orrery by BAA President Tom Boles during the BAA Christmas meeting.

A video of the presentation is available on the link below (courtesy Nick James). The video lasts just over six minutes and the size is 12MB. This will take about half an hour to download over a phone connection but it should play in real time if you have broadband.



<http://www.britastro.com/vid>
(Photo of Tom Boles and Sir Patrick Moore by Martin Mobberley)

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Forthcoming Meetings

February 3rd

Members Evening

March 3rd

James Wilhelm
“ Radio Astronomy for
Amateurs”

World's most powerful infrared camera begins observations in Hawaii

PARTICLE PHYSICS AND ASTRONOMY RESEARCH COUNCIL

Posted: December 22, 2004

A new astronomical camera has begun operations on the United Kingdom Infrared Telescope (UKIRT) in Hawaii. The Wide Field Camera (WFCAM), built at the UK Astronomy Technology Centre (UK ATC), Edinburgh, is the world's most powerful infrared survey camera. It will survey large regions of the sky at infrared wavelengths and is expected to discover both the nearest objects outside our solar system and the farthest known objects in the universe.

WFCAM has the largest field of view of any astronomical infrared camera in the world. In a single exposure it can image an area of the sky equal to that of the full moon.

"The ability to see such a large area at once, with state-of-the-art detectors, makes WFCAM the fastest infrared survey instrument in the world, bar none." said Dr Andy Adamson, Head of Operations for UKIRT.

WFCAM detects infrared light, or heat radiation, which is the key to understanding many types of astronomical objects. These include stars in our own Galaxy and beyond, interstellar clouds, the mysterious "failed stars" known as brown dwarfs, and quasars at the edge of the observable universe.

"WFCAM will be used to do surveys of the infrared sky which will detect objects one hundred times fainter than those in the deepest existing surveys. This survey programme will take up to seven years to complete and will provide astronomers with a picture of the infrared sky to unprecedented depth." said Dr Paul Hirst, WFCAM Instrument Scientist at UKIRT.

As part of its commissioning, led by Dr Hirst and Project Scientist Dr Mark Casali, WFCAM was trained on a region of star formation in the constellation of Orion, about 1500 light years from Earth. The full WFCAM image area is 1200 times larger than that covered by UKIRT's previous infrared camera UFTI, and 3600 times larger than that covered by the Hubble Space Telescope's infrared camera NICMOS. The astronomers combined observations with different infrared filters to give a 'colour' image, showing dramatic clouds of gas and dust in the southern half of the Orion nebula. The images reveal not only the illuminated edges of clouds and filaments, but also thousands of young stars that are otherwise hidden from view at visible light wavelengths by the gas and dust.

"Getting this unique instrument designed, built and tested was a major technical challenge that has been successfully completed through the dedication and skills of the multi-disciplined team at the UK ATC. To provide U.K. astronomers with this huge improvement in capability is part of the core mission of the UK ATC and marks the end of 5 years of hard work for the team." said David Lunney, WFCAM Project Manager at UK ATC.

At the heart of WFCAM are four "detector arrays". These are similar in concept to the CCD chips in everyday digital cameras, but use a mercury cadmium telluride crystal to make them sensitive to infrared radiation rather than visible light. Whilst a typical digital camera may take snapshots containing a few million pixels, WFCAM will map the infrared sky in vast tiles that contain over 250 million pixels each. When WFCAM is scanning the sky, it produces images at a phenomenal rate. In a single night, it will generate over 200 gigabytes of data — enough to fill over 300 CD-ROM disks.

Although the detector arrays occupy a space not much larger than a compact disc case, the entire WFCAM camera is huge. It is an imposing black cylinder, 5.4 metres (18 feet) long and weighing 1500 kilograms (1.7 tons), which points towards the sky from the telescope's primary mirror.

"This is a novel and unusual 'forward-cassegrain' optical design with WFCAM mounted just above the centre of the mirror. WFCAM's critical components are cooled to temperatures below -200°C (-325°F) so that their own heat glow doesn't swamp the tiny amounts of infrared radiation that we're trying to detect." explained Dr Hirst.

WFCAM's size, weight, and unusual position made even its installation at UKIRT an engineering challenge. It was built by the UK ATC in Edinburgh, and shipped to UKIRT in Hawaii. The team of engineers used a custom designed fork-lift truck to lift WFCAM carefully and very precisely into position over the telescope mirror.

"Achieving first light with WFCAM is the exciting result of many years of international collaboration between staff at the Joint Astronomy Centre in Hawaii and at the UK ATC. These stunning images are a testament to the hard work of everyone involved and we now look forward to several years of exciting scientific discoveries." said Professor Gary Davis, Director of the JAC.

Professor Ian Robson, Deputy Director of the UK ATC said "Building an infrared camera is relatively easy, but building the World's largest at an affordable price requires a high level of design ingenuity and professionalism. WFCAM is a tribute to the engineers of the UK ATC and we all look forward to sharing in the fantastic discoveries that WFCAM and UKIRT will bring, ranging from understanding the secrets of star formation to figuring out the formation of the first galaxies in the universe."



Stunning images taken with the new camera of the Trapezium region at the heart of the Orion Nebula may be viewed here:

<http://outreach.jach.hawaii.edu/pressroom/200>

The Wide Field Camera (WFCAM) has the largest field of view of any astronomical infrared camera in the world. In a single exposure it can image an area of the sky equal to that of the full moon. It is a novel and unusual 'forward-cassegrain' optical design shown here mounted just above the centre of the 3.8-metre-aperture United Kingdom Infra-Red Telescope (UKIRT) mirror.

Although the camera's four mercury cadmium CCD detector arrays occupy a space not much larger than a compact disc case, the entire WFCAM camera is huge. It is an imposing black cylinder, 5.4 metres (18 feet) long and weighing 1500 kilograms (1.7 tons), which points towards the sky from the telescope's primary mirror.

Image credit: Tomas Chylek,
[Joint Astronomy Centre](#)



Giant star's corona brightens with age, Chandra shows

CHANDRA PHOTO RELEASE

Posted: January 2, 2005

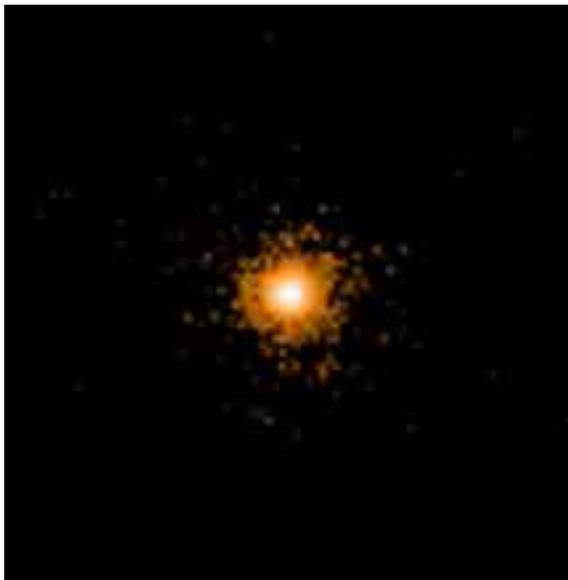
Beta Ceti is a bright, giant star with a hot corona that radiates about 2,000 times more X-ray power than the Sun. Scientists suspect that this X-ray activity is somehow related to its advanced stage of evolution called core helium burning. During this stage, the core of the star is very hot (more than a hundred million degrees Celsius) and converting helium to carbon via nuclear fusion reactions.

Using the theory of how stars evolve, we can reconstruct the history of Beta Ceti, a star with a mass of about 3 Suns. Over the first billion years of its existence, Beta Ceti was powered by nuclear fusion reactions converting hydrogen to helium in the core.

After the hydrogen in the core was exhausted, the central region of the star contracted until hydrogen gas around the helium core became hot and dense enough for hydrogen fusion reactions to ignite there. This powerful new energy source caused the outer regions of the star to expand greatly and cool. At this point Beta Ceti became a red giant. During the red giant phase, Beta Ceti would have been a very weak X-ray source.

After about 10 million years, the core of the star contracted and heated to more than 100 million degrees, enabling helium fusion reactions to occur there. In this core helium burning stage, which will last 100 million years or more, the overall diameter of the star has shrunk to about 20 times that of the Sun and the surface temperature has increased, so it is no longer a red giant star.

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Astronomy Picture of the Day

A year to the day of the meeting?



Apollo 17's Moonship

Awkward and angular looking, Apollo 17's lunar module **Challenger** was **designed for flight** in the vacuum of space.

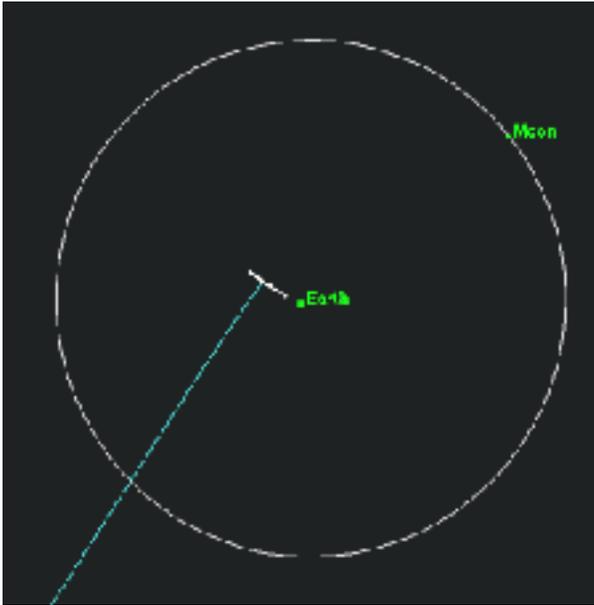
This sharp picture from the command module **America**, shows Challenger's ascent stage in lunar orbit. Small reaction control thrusters are at the sides of **the moonship** with the bell of the ascent rocket engine itself underneath. The hatch allowing **access to the lunar surface** is visible in the front and a round radar antenna appears at the top. This spaceship performed gracefully, landing on **the moon and returning** the Apollo astronauts to the orbiting command module in December of 1972

Asteroid 2004 MN4 will miss Earth in 2029

NASA's NEAR EARTH OBJECT PROGRAM OFFICE

Posted: December 27, 2004

Image credit: Paul Chodas / NASA / JPL.



In the accompanying diagram, the most likely position of 430-metre-long asteroid 2004 MN4 is shown at the end of the blue line near the Earth on April 13th, 2029. However, since the asteroid's position in space is not perfectly known at that time, the white dots at right angles to the blue line are possible alternate positions of the asteroid. Neither the nominal position of the asteroid, nor any of its possible alternative positions, touches the Earth, indicating that an Earth impact in 2029 is ruled out.

The passage of the asteroid by the Earth in 2029 alters its subsequent trajectory and expands the asteroid's position uncertainty region (i.e., the line of white dots increases in extent) so the asteroid's subsequent motion is less certain than it was prior to the 2029 close Earth approach. However, our current risk analysis for 2004 MN4 indicates that no subsequent Earth encounters in the 21st century are of any concern.

Over the past week, several independent efforts were made to search for pre-discovery observations of 2004 MN4. These efforts proved successful today when Jeff Larsen and Anne Descour of the Spacewatch Observatory near Tucson, Arizona, were able to detect and measure very faint images of asteroid 2004 MN4 on archival images dating to March 15th, 2004. These observations extended the observed time interval for this asteroid by three months allowing an improvement in its orbit so that an Earth impact on April 13th, 2029 **can now be ruled out**.

As is often the case, the possibility of future Earth impacts for some near-Earth objects cannot be entirely ruled out until the uncertainties associated with their trajectories are reduced as a result of either future position observations, or in this case, heretofore unrecognized, pre-discovery observations. When these additional observations were used to update the orbit of 2004 MN4, the uncertainties associated with this object's future positions in space were reduced to such an extent that *none* of the object's possible trajectories can impact the Earth (or Moon) in 2029.

Cassini to end 2004 with flyby of icy moon Iapetus

CASSINI MISSION REPORT

Posted: December 30, 2004

NASA's Cassini spacecraft is set to cap off 2004 with an encounter of Saturn's ying-yang moon Iapetus (eye-APP-eh-tuss) on New Year's Eve.

This is Cassini's closest pass yet by one of Saturn's smaller icy satellites since its arrival around the ringed giant on June 30 of this year. The next close flyby of Iapetus is not until 2007.

PTO

Iapetus is a world of sharp contrasts. The leading hemisphere is as dark as a freshly-tarred street, and the white, trailing hemisphere resembles freshly-fallen snow.

Cassini will fly by the two-toned moon at a distance of approximately 123,400 kilometers (76,700 miles) on Friday, Dec. 31. This flyby brings to an end a year of major accomplishments and rings in what promises to be a year filled with new discoveries about Saturn and its moons.

"I can think of no better way than this to wrap up what has been a whirlwind year," said Robert T. Mitchell, program manager for the Cassini mission at NASA's Jet Propulsion Laboratory, Pasadena, Calif. "The new year offers new opportunities, and 2005 will be the year of the icy satellites."

In 2005 Cassini will have 13 targeted encounters with five of Saturn's moons. "We have 43 close flybys of Titan still ahead of us during the four-year tour. Next year, eight of our 13 close flybys will be of Titan. We will also have a number of more distant flybys of the icy satellites, and let's not forget Saturn and the rings each time we come around," said Mitchell.

With a diameter of about 1,400 kilometers (890 miles), Iapetus is Saturn's third largest moon. It was discovered by Jean-Dominique Cassini in 1672. It was Cassini, for whom the Cassini-Huygens mission is named, who correctly deduced that one side of Iapetus was dark, while the other was white. Scientists still do not agree on whether the dark material originated from an outside source or was created from Iapetus' own interior. One scenario for the outside deposit of material would involve dark particles being ejected from Saturn's little moon Phoebe and drifting inward to coat Iapetus. The major problem with this model is that the dark material on Iapetus is redder than Phoebe, although the material could have undergone chemical changes that made it redder after its expulsion from Phoebe. One observation lending credence to the theory of an internal origin is the concentration of material on crater floors, which implies that something is filling in the craters. In one model proposed by scientists, methane could erupt from the interior and then become darkened by ultraviolet radiation.

Iapetus is odd in other respects. It is the only large Saturn moon in a highly inclined orbit, one that takes it far above and below the plane in which the rings and most of the moons orbit. It is less dense than objects of similar brightness, which implies it has a higher fraction of ice or possibly methane or ammonia in its interior.

The last look at Iapetus was by NASA's Voyager 1 and 2 spacecraft in 1980 and 1981. The Cassini images will be the highest resolution images yet of this mysterious moon.

The Iapetus flyby by Cassini follows the successful release of the Huygens probe on December 24. The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. JPL, a division of the California Institute of Technology in Pasadena, manages the Cassini mission for NASA's Science Mission Directorate, Washington, D.C. JPL designed, developed and assembled the Cassini orbiter. The European Space Agency built and managed the development of the Huygens probe and is in charge of the probe operations. The Italian Space Agency provided the high-gain antenna, much of the radio system and elements of several of Cassini's science instruments.

Cassini spacecraft targeted satellite encounters for 2005:

- | | |
|----------------------------|--------------------------------|
| - Titan: January 14, 2005 | - Titan: September 7, 2005 |
| - Titan: February 15, 2005 | - Hyperion: September 26, 2005 |
| - Enceladus: March 9, 2005 | - Dione: October 11, 2005 |
| - Titan: March 31, 2005 | - Titan: October 28, 2005 |
| - Titan: April 16, 2005 | - Rhea: November 26, 2005 |
| - Enceladus: July 14, 2005 | - Titan: December 26, 2005 |
| - Titan: August 22, 2005 | |

Report: Shuttle servicing of Hubble is best option

To ensure continuation of the extraordinary scientific output of the Hubble Space Telescope and to prepare for its eventual de-orbiting, NASA should send a space shuttle mission, not a robotic one, says a new congressionally requested report from the National Academies' National Research Council. The agency should consider launching the manned mission as early as possible after the space shuttle is deemed safe to fly again, because some of the telescope's components could degrade to the point where it would no longer be usable or could not be safely de-orbited, said the committee that wrote the report.

"A shuttle servicing mission is the best option for extending the life of the Hubble telescope and ultimately de-orbiting it safely," said committee chair Louis J. Lanzerotti, distinguished research professor at the New Jersey Institute of Technology, Newark, and consultant, Bell Laboratories, Lucent Technologies, Murray Hill, N.J. "NASA's current planned robotic mission is significantly more technologically risky, so a robotic mission should be pursued only for the eventual removal of the Hubble telescope from orbit, not for an attempt to upgrade it. Also, a shuttle mission could be used to place equipment on the telescope to make a robotic de-orbiting mission more feasible."

The Hubble telescope, which has operated continuously in orbit for the past 14 years, was designed to be serviced regularly by astronauts. Four servicing missions replaced nearly all the key components while increasing the telescope's capabilities. The fifth and final mission -- to replace aging batteries, fine-guidance sensors, gyroscopes, and two scientific instruments -- was originally intended to be completed by a shuttle crew as well, but NASA is currently planning an unmanned mission to service the telescope robotically.

The committee's principal concerns about a robotic mission are the risk of failing to develop it in time and the risk of a mission failure, as well as the possibility that the robot could critically damage the telescope. A robotic mission would face significant challenges in using its grapple system to perform autonomous close-proximity maneuvers and the final capture of the space telescope -- activities that have no precedent in the history of the space program and whose chances of success are low, according to the committee.

"Our detailed analyses showed that the proposed robotic mission involves a level of complexity that is inconsistent with the current 39-month development schedule," said Lanzerotti. "The design of such a mission, as well as the immaturity of the technology involved and the inability to respond to unforeseen failures, make it highly unlikely that NASA will be able to extend the scientific lifetime of the telescope through robotic servicing."

The committee assessed the safety risks of a shuttle servicing mission by comparing shuttle missions to the International Space Station -- to which NASA plans to send 25 to 30 more shuttle flights -- and shuttle missions to the Hubble telescope. The differences between the risks faced by the crew of a single shuttle mission to the space station and the risks faced by the crew of a mission to the Hubble telescope are very small, the committee concluded.

Also, a shuttle crew would be able to successfully carry out unforeseen repairs to the Hubble telescope and develop innovative procedures for unexpected challenges in orbit, the report notes. Such contingencies have been successfully addressed on three of the four prior missions to the telescope. A robotic mission, on the other hand, might not be able to repair failures that it is not designed to address, possibly stalling the mission in its early stages.

"With the replacement of aging components and the installation of new science instruments, Hubble is expected to generate as many new discoveries about stars, extra-solar planets, and the far reaches of the universe as it has already produced so far, with images 10 times more sensitive than ever before," Lanzerotti said.

The study was sponsored by NASA. The National Research Council is the principal operating arm of the National Academy of Sciences and the National Academy of Engineering. It is a private, nonprofit institution that provides science and technology advice under a congressional charter.

February Night Sky



Moon

New	8 th	1 st Qtr	16 th	Full	24 th	Last Qtr	2 nd
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Events:

6th - 9th α Aurigids Possible rate of 10 per hour

12th Libration good for Moon's eastern maria

20th Libration good for Moon's southern polar area

21st Occultation \circ Cancri by dark limb of gibbous Moon (00.24 hrs.)

Planets:

Mercury	Becomes an evening object by end of month Mag -1.0 to -1.5
Venus	Almost full phase disk , getting lower in morning sky at Mag -3.7
Mars	Rises about 05.00 hrs, low in morning sky at Mag $+1.4$ in Scorpius
Jupiter	In Virgo, rises 21.15 by end of month, Mag -2.2
Saturn	Now past opposition, still in Gemini, well placed for late evening and early morning viewing. Culminates at 22.30 at start of month, but about 21.00 at end as it draws away with its magnitude fading from -0.3 to -0.1
Close Encounters	
4th	Crescent Moon only 1.1° from Antares
8th	Mars between M8 Lagoon Nebula & M20 Triffid Nebula
10th	Io, Ganymede & Callisto form tight group west of Jupiter (04.00 hrs)
19th	Mars 24' north of M22 (globular cluster)
21st	Jupiter 14' south of θ Virginis
27th	Jupiter 1.2° from Moon (unless you're in Antarctica – where Jupiter is occulted!)

Comet

Comet 2004 Q2 (Machholz), is now between Cassiopeia and Camelopardalis, moving into Cepheus by end of month (diagram courtesy of Lee Macdonald).

Constellations:

The following are well placed:

Andromeda, Perseus, Auriga, Taurus, Orion, Lepus Monoceros, Canis Major, Gemini, Cancer, Leo, Sextans, Hydra, Coma Berenices

Sources:

FAS Astro Calendar 2004/2005, Astronomy Now (Feb), Sky & Telescope (Feb), Popular Astronomy (Jan-March)

