FAS Newsletter

Federation of Astronomical Societies http://www.fedastro.org.uk

FAS Annual Convention 9 October 2010

Institute of Astronomy, Cambridge

The FAS Annual Convention will be held at The Institute of Astronomy, Madingley Road, Cambridge on Saturday 9th October.

At the time of editing this edition the list of speakers who have committed to present talks at this years event is almost complete. The agreed speakers include:

Professor Philippa Browning from Manchester University whose research area is Solar and Laboratory Plasmas will present a talk entitled 'Our Active Sun'.

Dr Peter Wheatley, an associate professor in the Astronomy & Astrophysics Group in the Department of Physics at University of Warwick will cover 'Hunting for extra-solar planets using small telescopes'

Professor Tim Naylor is Norman Lockyer Professor of Astrophysics and Head of Physics at Exeter University. The title of Professor Naylor's talk was not available at this time.

In addition to the talks there will be a range of exhibitors, where you will be able to drool over shiny pieces of astronomy kit, find that elusive book you have been searching for and to try to win one of the many prizes in the, now, famous FAS raffle.

Keep an eye on the FAS website for registration details.

For those who have not yet attended an FAS Convention, please come along, you will not be disappointed.

z376 : Patrick with Dr Gary Latham, Apollo 11 Lunar Seismologist

THE PATRICK MOORE COLLECTION

An appeal for help

*by **Mark Irving***

In November 2008, Trevor Little, Leanne Irving and I were visiting Patrick Moore on a social evening. The discussion turned to Patrick's large collection of photographic slides, which he has accumulated over the course of his career. It turned out that Patrick had wanted these to be better used for some time, but the fact that they were physically stored in cabinets in his 'slide room' meant that they rarely saw the light of day. Few people even have the equipment to view slides any more.

It was at this point, after a couple of glasses of wine perhaps, that we suggested that the collection should be scanned using a computer, and published on the internet for public viewing and use. Everyone present thought that the idea was excellent in principle, but the task probably impossibly large...

After another glass of wine, we proceeded to have a quick estimate of the number of slides involved. They were mostly stored in filing drawers specifically made for the purpose, with each draw holding a couple of hundred slides. We guessed that there were perhaps ten to fifteen thousand slides altogether, so the obvious question was: would it be possible to scan them all?

A bit of research on the internet quickly showed that domestic slide scanners might be suitable for scanning slides, but they were no good for a job this large. At best they would scan slides in batches of 3 to 5, and would therefore require continuous supervision and reloading. We did, however, manage to find a machine that would process slides in batches of 50 or 100. In a fit of irrational enthusiasm and optimism, we purchased this scanner and borrowed a sizeable chunk of Patrick's slide collection to start work.

Initial results with the scanner were promising; the quality of the images was good, and despite taking around 5 hours to scan a carousel of 100 slides at maximum quality, it could be left unsupervised between reloading. We could process 200 to 300 slides a day with relatively minimal intervention.

Things went downhill a little when we discovered that not all slides are created equal. The collection includes the familiar cardboard 35mm slides, but also metal-framed solid glass, plastic-framed glass, and plastic-framed flexible slides. These vary in thickness and weight, and have to be separated to scan smoothly. Furthermore, the 100-slide circular carousels only work if fully loaded to ensure even weight distribution and proper balance. The original plan of scanning slides in sets with sequential numbering fell apart, and we had to scan physically similar slides together then renumber them afterwards.

In parallel with the scanning effort, I worked on developing a suitable website to showcase the collection. After over a year's work (allowing for the arrival of a baby somewhere in there!), we have now scanned around 10,000 slides and have a working (if incomplete) website. If you visit www.patrickmoorecollection.com, you can see the

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Presidents Spot

Greetings from the FAS!

Well another newsletter means another opportunity for me to communicate directly with you the members of the FAS. I'm pleased to note that we have been able to significantly discount the FAS membership subs for those societies who have promptly paid them. Also we have significantly reduced the PLI premium.

How have we been able to do this? It has only been possible because FAS Council members have been working hard at generating income from the production and sale of the Astrocalendar and other astronomy booklets. This income has subsidised your subs and PLI costs. For us to be able to continue to do this we need to maintain Council members!

Therefore this year I'm starting my appeal early for volunteers to put themselves forward for Council duty in time for the AGM on 9th October. Not sure what the Council posts and duties are? I'm going to post details on the FAS website so keep an eye out for that. I'm determined that you will have a better idea of what Council members do and can properly consider whether you should put yourself forward for a spell on Council. You don't need special knowledge or skills just a willingness to help out. It sometimes comes as a surprise to some of our members that FAS Council members are not paid employees but just volunteers who give of their time and effort like any other astronomical society committee member.

The other thing I'd like you to consider is what you'd like the FAS to be doing for its member societies. I'd be pleased to receive your ideas and comments, just e-mail me at president@fedastro.org.uk. We can't make any promises to adopt your suggestion as Council members are just volunteers but we would consider suggestions.

Each year at the AGM the FAS awards the Eric Zucker Prize (a plaque and £50 book token) to someone who has been a great promoter of Astronomy to the public and/or Astronomy educator. If there is someone you would like to nominate for FAS Council consideration for the award please let us know and tell us why you think he/she would qualify for the award.

Finally, may I wish you and your society clear skies and happy observing!

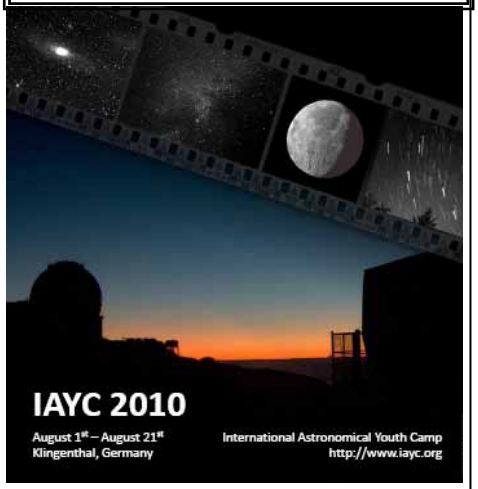
Richard Sargent

APPEAL FOR STANDBY SPEAKERS FOR THE FAS ANNUAL CONVENTION

The 2010 FAS Convention will be held at the Institute of Astronomy, Cambridge on Saturday, 9th October. As usual the day will include a programme of talks by invited speakers. In case a programmed speaker has to cancel at short notice, the FAS is looking for one or two volunteer speakers from member societies who would be willing to act as emergency stand-in speakers at the Convention if required. This would require attendance on the day on standby. Reasonable travel expenses and free entry to the Convention would be provided. If called upon to give a talk then a laptop and multimedia projector would be available but the volunteer would have to bring their talk along on a memory stick or CD-ROM.

If you are interested in volunteering please contact the President of the FAS on:

president@fedastro.org.uk and provide details of the talk(s) you could give. *Thank you.*



If any of your members are interested in attending this event log onto ***www.iayc.org*** to find out more.

Liverpool AS—Star Party at Ainsdale Discovery Centre

I arrived, by train from Liverpool Central Station, at about 19:10. As I had not seen any sign of the Sun all day I was not expecting this event to have clear skies. However, the 1st quarter Moon was easily visible in the 20 minute walk to this event.

Jim Stacey was starting to set up his Celestron C6 f12 GoTo telescope when I arrived and Brendan Martin soon had his 10 inch Dobsonian Reflector set up to view the Moon and Mars. The limiting magnitude, at about 19:15, was approximately 3, within about 30 degrees of the zenith. Below that altitude the fog made it very difficult to see anything.

At about 19:36 I was able to see a very good view of Mars in Jim Stacey's C6 with a 6mm 300x eyepiece. A polar cap was easily visible, as well as a large dark region below it.

Just after 19:30, the Ainsdale Ranger, Rachel, turned off the external fluorescent lights. This made viewing a lot easier. Rachel also provided access to hot drinks and biscuits that were much appreciated.

At about 19:50 the fog started to get thicker and by about 19:53 the Moon had almost dissappeared. At about 20:00 Geoff Regan started his talk in the Visitors Centre - "Our Place in Space". This was followed, after a short intermission, by Brendan Martin's talk - "My Favourite Objects Through a Telescope".

Lawrence Ashworth set up his 4 inch refractor and Graham Roberts set up my 3 inch f4 reflector that he had brought in his car and Jim Lawler and Derek Heslin set up their 25 x 100 binoculars and almost immediately proceeded to improvise some dewcaps for them.

Other LAS members that I remember being there were Pam McAdams and Alan Dennott

This lasted from about 20:45 to about 21:15. By then, it was time to pack up and go our seperate ways.

Jim Stacey and Alan Dennott were able to take pictures of this event which can be seen on page 9:

Dave Owen

(Continued from page 1)
current state of progress.

So why, you might ask, mention all this when it isn't even finished yet? The answer is simple: the three of us can never hope to finish the task on our own. As time has gone on, we have discovered that our early estimates of the size of the collection were a little conservative. Extra slides keep turning up in drawers, boxes and suitcases! We now guess the total to be closer to 20,000 or even 25,000.

We can scan the slides, given time, but we could never give them all useful titles. They currently have unhelpful designations such as

ant065 : Patrick in front of Mount Erebus, Antarc-

'a034' and 'xc174'. These codes refer to Patrick's original typewritten index. We have copied this as well as the slides, and what we now need is a small army of volunteers to type in the titles for each slide. The task, given manpower, is not insurmountable. I titled a hundred or so slides in a couple of hours recently, and so a hundred volunteers could probably complete the job in around half a day.

ar065 : 1991 Launch of Progress M-7 rocket, Russia

In short, we need your help. No previous experience is required, although an interest in astronomy will certainly be a bonus as you'll be viewing Patrick's collection and it is fascinating in its diversity. All entries will be proof-checked before publication, so there's no need to worry too much about possible typing errors causing embarrassment. Of course, the greater accuracy, the less work for us afterwards!

The work involves logging in to the website (contact us for a password) and downloading the index pages. You can print these, or keep them to one side of the screen. You then select a set of slides and simply enter the titles for each slide from the index. Even if you only do a few at a time, the collection will soon be complete.

Once all of the slides have meaningful titles, it will be possible to search the database for pictures on almost any astronomical topic you care to mention. It is our hope, and Patrick's, that the slide archive will prove an invaluable tool to students and researchers, as well as giving enjoyment to many amateur astronomers who simply wish to browse.

We will continue to work on improving the website and scanning the rest of the collection, and hope that many of you will enjoy getting involved in this huge and rewarding project.

If you would like to help, please contact Mark and Leanne at astro@mjiccs.co.uk.

LETTERS

Hi Frank

Irish Whirlpool Party

Just to let all your readers know that WSP at Birr Castle is back.

It is to be held from Oct 8–10th 2010.

All will be very welcome.

Details will be posted on Birr Castle's web site.

Best regards

Tony O'Hanlon
Co-Ordinator, WSP at Birr

Soaking up the Sun (i.e. observing) at Arecibo

It's not every day you go to work and get told that you are going to Puerto Rico next week. Well for radio astronomers this probably happens a little more often than the norm since the wonderful Arecibo observatory is there.

Before I left I'd not quite realised how un-American Puerto Rico would be. I'm glad I had that GCSE in Spanish - as if that really helped. At least I was able to order water

without any hassle. Of course once at the observatory I was surrounded by Brits! Oh well. I have to say it was welcome break from the frozen tundra of Calgary (it was -35C when I left).

You may know the telescope from the sci-fi film Contact and they did indeed record it there. I stayed in the "wooden hut" next to the one they filmed Jodie Foster in. I was disappointed that I didn't end up in the right one. The Arecibo Observatory is operated by Cornell University under cooperative agreement with the National Science Foundation. The observatory's 305 m radio telescope is the largest single-aperture telescope ever built. Its just breathtaking when you see it. I also got to go up onto the receiver and though scared at first you'd be surprised quite how solid it is. After 20 minutes up there you forget quite how high up you really are!

So why was I there? Well I work for the University of Calgary and we are conducting a large survey of the galactic plane with the telescope called GALFACTS. GALFACTS is a project by the GALFA Continuum Consortium to use the new Arecibo L-band Feed Array (ALFA) to carry out a spectro-polarimetric survey of the sky visible from the Arecibo Observatory. It should provide the most detailed polarimetric view of the sky to date and is going to take around 1000 hours of observing time.

Controlling Arecibo telescope is actually remarkably simple. This is probably the easiest

observing experience I have. Now that could be due to the fantastic support staff or just the brilliant software.. either that or I got the wrong end of the stick and the data I took will come out pants (maybe I shouldn't have been watching Top Gear in the control room..)!
I would urge you, if you ever get chance to go to the Caribbean go take a stop in Puerto Rico - Arecibo is around an 1.5hours away from San Juan (the capital) and everyone is nice and friendly.

Dr Samuel George
Institute for Space Imaging Science
University of Calgary

Editor's Grovel !!

On page 10 of Newsletter 92, the article on a lecture given at Worthing AS was wrongly attributed to SAGAS.
Jan Young of Wothing AS has pointed out that they have no connection with SAGAS.
Apologies for this error Jan.

Ed

Book Reviews

A Spectroscopic Atlas of Bright Stars by Jack Martin Published by Springer

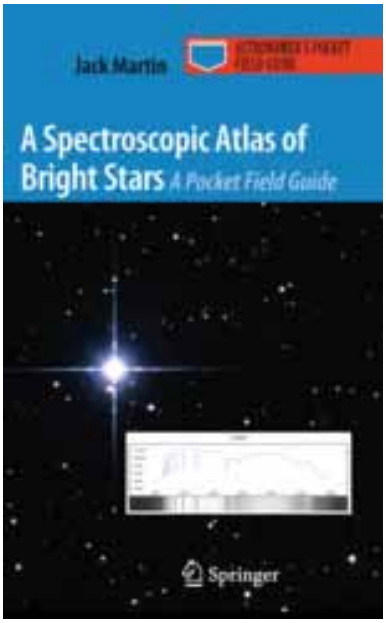
ISBN: 978-1-4419-0704-2 £24.99

Published by Springer as part of the Astronomer's Pocket Field Guide series. The format of this book, 5 x 8 inches (127 x 203 mm) is designed to fit into a coat pocket etc., but be large enough to provide usable data in field conditions. The Publishers objective of this new series is to "provide succinct, targeted information for practical observers." and in this regard Jack's book fits the bill. In 200 pages it covers the subject very well.

Presented in two parts; Part 1 being an eighteen page section which describes the equipment used to obtain the spectra, a couple of reference tables; the Greek alphabet, and the Periodic table of elements which are then followed by a brief overview section on the classification of stars. Part 2 is the spectral atlas, giving a spectrum, the stars position, technical details of brightness and spectral class, and a small constellation finder chart for each of the 72 stars listed. A star index (both by spectral type and by position (RA and Dec) is included followed by a comprehensive glossary of terms which the beginner will find very useful when starting spectroscopy for the first time.

The chapter on Jack's telescope, camera equipment, and the processing of his spectra film is an abbreviated version of the chapter he presented in the "Practical Amateur Spectroscopy" edited by Steve Tonkin, Springer, 2003. The use of a 300mm f5.3 Dobsonian telescope combined with a Rainbow Optics transmission grating (200 l/mm) shows that usable spectra can be obtained with 2 to 5 min exposures without the expensive of sophisticated GOTO instruments. It may appear strange in this day and age of digital cameras and CCD's that Jack still uses Black and White film to record his spectra, but his results show that the extended film sensitivity especially in the UV region can reap rewards. He recommends the Ilford range of Pan F 50, FP4 125, HP5 400 as well as Kodak TMAX 100-400-3200. After processing, the prints are digitally scanned for further analysis.

Jack makes use of Christian Buil's digital imaging software "IRIS" (used to pre-process the scanned prints to .fits files) combined with Valerie Desnoux's Visual Spec software to allow wavelength calibration and comparison with standard reference spectra. (Both of these programs are freeware and readily available on the Web.)



The format of the Atlas presents the spectrum (at an average scale of 30Å/mm) of each star which covers the wavelengths from approx 3500Å (UV) through to 6400Å (red) together with a graphical intensity profile on one page and on the opposite a finder chart and table of data (including the identified spectral lines). It's nice to see that the common name, Bayer and HD number are provided for each star. The sequence of spectra presented follows the Stellar Classification (OBAFGKMN) from the hottest stars to the coolest. If you are looking for a particular star you'll need to refer to the index. With Jack's choice of stars, there are at least two or three examples of each classification which reinforces the obvious absorption lines visible.

This Atlas provides a wealth of data for the beginner in spectroscopy and provides useful comparison spectra for a whole range of stars which are easily visible in the northern hemisphere. Using a digital camera, and a transmission grating (like the Rainbow Optics or the Star Analyser) on a small telescope a novice could replicate the spectra presented, and with the aid of this Atlas confidently identify the absorption lines visible. It won't give you all the information you need to set-up and use the spectroscope nor all the details of spectral calibration but it does provide what it says on the box - "provide succinct, targeted information for practical observers."

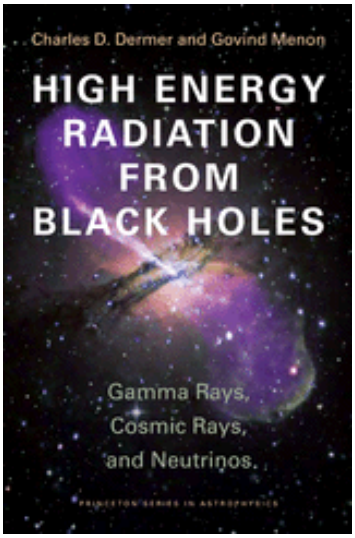
Ken Harrison

High Energy Radiation from Black Holes: Gamma Rays, Cosmic Rays, and Neutrinos.

Author: Charles D. Dermer Govind Menon

Publisher: Princeton University Press ISBN: 978-0691144085 Price: £48.95

This book addresses some of the most enigmatic and exotic phenomena know to human-kind. It includes study of Black holes and Gamma Ray Bursts that are at the cutting edge of our understanding of the universe. It is fast evolving and highly complex field that is developing as our new technology allows us to measure these exotic particles as never before. This book is written for the professional astronomer and is described in the cover note as being "for graduate students and researchers".



I do technically fall into one of the above groups, I graduated from Sheffield University in 1999 with a BSc (hons) in Physics with Astronomy and on many occasions this book had me delving back into undergrad texts to refresh my memory of terms that were lurking in the mists of memory.

As an amateur astronomer, this book certainly felt immediately challenging. The development of the theory begins with relativity and lorenz transformations, this is certainly a no-holds barred technical tome that requires one's full attention. It builds its analysis on many cornerstones of astrophysics such as blackbody spectra and synchrotron radiation, developing each section through rigorous mathematical derivation.

This book is certainly not for the mathematically faint hearted. Although the appendices include entire sections on relevant mathematical functions and appropriate calculus, the book is utterly built on complex mathematical description. This is certainly not a criticism however as a subject such as this is utterly dependent on such rigorous analysis. From an amateur perspective I found that I could often skip through sections that became too heavy and I could pick up the flavour of the argument without necessarily following every last point.

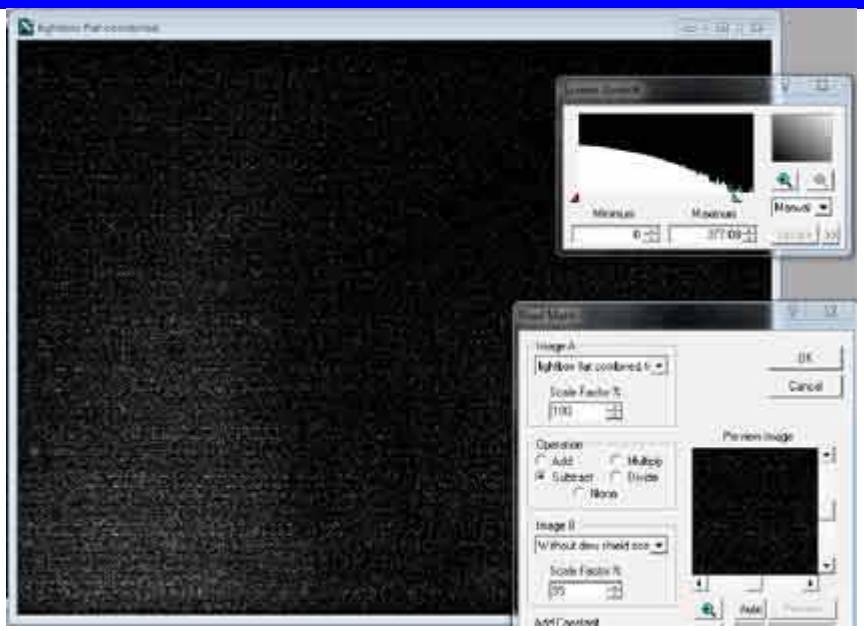
Although clearly being a valuable and comprehensive book for the professional astronomer, I am not sure how many amateurs would find this book useful. I am not aware of amateurs being directly involved in research into these exotic forms of high energy radiation. The prerequisite of being either outside of the atmosphere for gamma rays and cosmic rays or deep underground to detect neutrinos generally limits this kind of work to those with more financial clout than most amateurs.

As a "general interest" book for the armchair astrophysicist, I would think that (for most people) its depth of analysis would possibly be too great and there are better general interest books out there. This book firmly falls into the "research" category where one would dip in and out as necessary to extract the information needed in a particular context. On the whole I would guess that this would probably not be the kind of reference that most amateurs would need.

Darryl Sergison

Equipment Review

Electro-Luminescent sheet for flat frames



As many imagers will agree, taking good flat field calibration frames can be a bit of a black art. A flat field (an image of an evenly illuminated source) can be used to calibrate image frames for image sensor pixel sensitivity differences and to remove optical affects such as dust spots and vignetting.

My main field of astronomical imaging interest is photometry and in order to accurately measure the brightness of an object, good flat frames are essential. In addition, I need to take flats every time I am imaging and with each filter combination.

If you are lucky enough to have a clear sky at sunset and you are all set up in time then you can get very good results taking "Skyflats". The window of opportunity for this though can be surprisingly short and of course this presupposes a lack of cloud. Another option is the "dome flat". Some people seem to be successful in illuminating a plain section on the inside of their observatory but I have to admit limited success using this method.

As a result I have been recently looking for an alternative to the above methods that would allow a quick and easy way of taking good flat frames. I believe that the electro-luminescent sheet provided by poster-power-UK offers a very suitable solution.

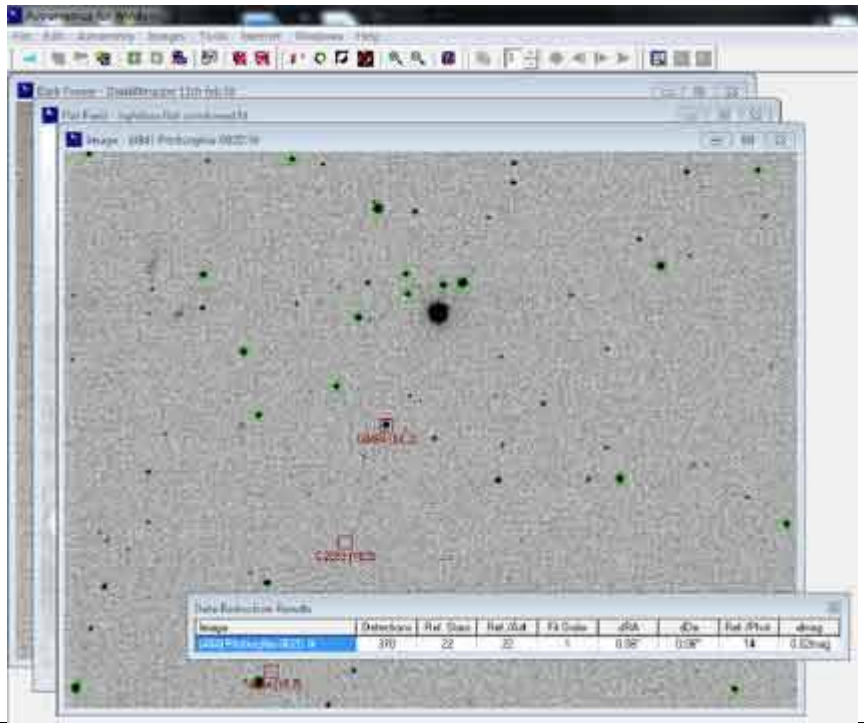
The sheet was provided as a square approximately 11" square. This was perfect for my 10" aperture. The sheet itself is about 0.25mm thick and is flexible, with a copper rail along one side and an electrical connection in one corner. It also came with its own mains transformer. When not illuminated the sheet appears a light pink colour, but when powered it glows white with a visibly even illumination.

In order to use the sheet, I had to make up a small frame for it and I used white acrylic sheet as a diffuser to ensure an even illumination. This also serves to protect the electro-luminescent sheet.

My first test was to take some flats with the sheet in place on the front of the telescope and then repeat the exercise having rotated the light sheet through 90°. The telescope was a 10" LX200 and the CCD was a QHY6 Pro. The system was focussed and the stacked flat showed a combination of dust motes on several optical surfaces. Images were taken using an exposure of 0.2 seconds using VBE compensation mode.

I compared the two orthogonal flats generated (each one being an averaged combination of 10 frames) and subtracted one from the other. The subtracted frames showed a pixel variation of less than 0.7%, indicating that whilst not identical, there was little difference between the two.

My second test was really to directly compare the calibration performance of good sky flats with flats produced by the electro-luminescent sheet. Unfortunately poor weather at my observatory in Cornwall (www.gothersobservatory.org.uk) toward the end of 2009 delayed this test, however eventually I had a good evening that allowed a set of sky flats and electro-luminescent sheet flats to be taken. The two images were both used to calibrate that evening's asteroid photometry session as shown below.



Images of main belt asteroid (484) Pittsburghia were collected and calibrated using Astrometrica. Plate fits were derived using 14 stars from the CMC-14 catalogue and this process repeated using both Sky and Sheet flats. Astrometrica produced identical solutions with both flat frames, residuals being 0.02mag.

I have been using the electro-luminescent sheet now for 3 months and have reduced 18 nights worth of data. In every case the flats appear to produce good plate solutions (everything else being equal) and I now am able to easily and quickly take flats for every session. I typically take 10 images each of 0.15 seconds exposure time and average stack these in my image processing software. The image duration would be altered for a different telescope/camera combination but the principle should be the same.

Despite having to make up a small frame for the sheet, it has proven to be an invaluable addition to my imaging setup and has made obtaining good photometry data just that little bit easier. Whilst my interest is not so much in producing "pretty pictures", I can see no reason why this product would not be very suitable for that as well.

Darryl Sergison

All is Well in Sunny Spain With The Jávea & District Astronomical Society

In the International Year of Astronomy, the J&DAS enjoyed its most successful year to date. Despite the extreme disappointment of not being able to raise sufficient funds to bring Charlie Duke (the 10th man to walk on the moon) across the Atlantic to give us a talk on his experiences as an Apollo astronaut and a moon walker we have, nevertheless, been extremely busy with our endeavours to encourage people to take an interest in the fascinating subject of astronomy. This has resulted in a fourfold increase in our membership from less than 12 to over 40.

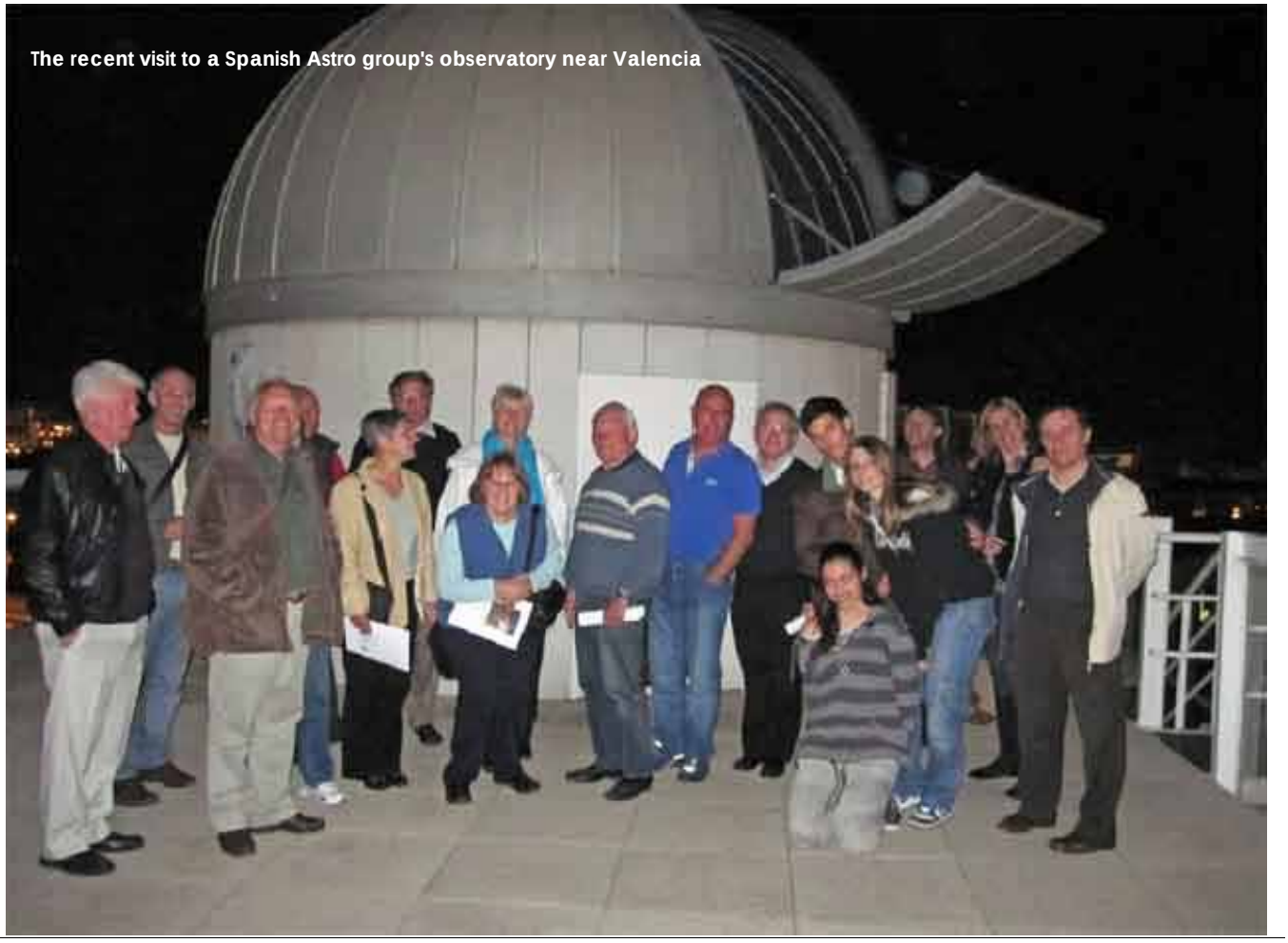
We have held 2 very successful star parties for our own group, the first of which we combined with the Perseid meteor shower in August. The second, in September, involved 30 members spending 2 nights up in the mountains in Hotel Alahuar in Benimaurel, near Denia, here on the Costa Blanca. Although the weather threatened to turn the event into a disaster, the sky rather miraculously cleared on both nights permitting some excellent viewing for all concerned. The event began with a briefing by Christine Ord, the U3A Denia (to which the J&DAS is affiliated) Astronomy Group Leader. The group also enjoyed a not too strenuous walk in the local mountains, an astronomy quiz and a meal together in the hotel prior to viewing on the last night. Both viewing sessions commenced with an audio tour of the night sky which the beginners found to be extremely useful and informative. Highlights of the viewing were a clearly visible Milky Way, Jupiter, the Dumbell Nebula was also very clear, the Andromeda Galaxy, several clusters and double clusters as well as the lovely double stars.

Our Society has also been busy giving presentations to other U3A groups in our local area most of which have between 500 and 800 members. This has resulted in another astronomy group starting up under our guidance and for which we have assisted in running a star party.

The other highlight of our year to date was a presentation by Fr. Manny Carreira entitled “Exploration of the Solar System”. Fr. Manny now lives in Madrid and previously spent 15 years on the Board of Vatican Astronomers in addition to spending approximately 50 years working in the USA during which time he was a regular commuter between the USA and Spain. His knowledge of astronomy was most impressive as were his views on global warming, during the question and answer session, and the many interesting stories about his life and work that he recounted over the dinner hosted by some of our members in a local Denia restaurant.

We have once again produced an Astronomy Calendar and are confident that it will prove to be as popular as our 2009 version. For more information on our Society please visit www.u3adenia.org and find us under groups where you can also read our Newsletters which are produced on a monthly basis.

Ed Morley
Secretary - Jávea & District AS



The recent visit to a Spanish Astro group's observatory near Valencia

WAS JANUARY LECTURE REVIEW

My Astronomical Journey—Speaker: Richie Jarvis, Adur Astronomical Society

Richie became interested in astronomy as a hobby in 2001 and his interest has developed through several stages since then. His talk was designed to take us through his journey from 2001 to the present, with an account of what he has done, what kit he has been using, what has gone right and what has gone wrong. He explained that it is very easy to buy the wrong kit and to waste money as a result.

When Richie started his first telescope was a 3" reflector with 0.75" eyepieces. The scope was unguided and gave Richie the opportunity to view the Moon, Jupiter and Saturn, but not much else - the mount was terrible. However, it was a useful start and whetted Richie's appetite for taking the hobby further. Christmas and birthdays have been useful for Richie in upgrading his equipment at each stage.

NGC2024 Flame Nebula

Richie sees the next stage as his 'graduation'. He purchased an 8" Helios reflector and a Synta EQ4, but it was not a GoTo mount. Richie also had to contend with a heavily lit garden. It would take him one hour to set up the equipment and to take it down afterwards - not ideal in our changeable weather. He was still limited to astronomical observation only - and could observe all the major planets.

Richie sold this telescope and purchased a Meade ETX-105. With a GoTo mount he could now find what he wanted to look at automatically, rather than having to find the objects himself in the vastness of the sky.

Other equipment Richie used at this time included Meade 4000 series eyepieces with a 2x Barlow converter, and Celestron 40mm, 26mm, 12mm and 6mm eyepieces. Richie was still observing exclusively from that heavily lit garden, and also was still learning his way around the sky. He could now see galaxies and nebulae as he was able to observe deeper sky than before.

On December 9th, 2003 Richie imaged the sky for the first time, using the ETX-105. Using an Olympus C3000 camera and a hand-held eyepiece he obtained an image of the Moon. Next Richie mounted the camera on top of the eyepiece, taking care to ensure that it was tight enough to prevent the camera flopping down.

In 2005 Richie purchased his first astronomical camera – a Meade LPI imager. Using the ETX-105 he imaged Saturn on February 7th, 2005 and the Moon on June 1st, 2005. He soon found that it was possible to obtain terrific detail in his images using cheap webcams, without the need for accurate tracking. Nevertheless, he was still keen to achieve more.

On February 4th, 2006 he imaged a deep sky object for the first time - The Great Orion Nebula - again using the Meade ETX-105. Using the Meade LPI he took a series of 5 second subs (unguided), and then added them together to produce the composite image. Already he was thinking of what further cameras he would need in order to produce even better images.

In June 2006 Richie purchased a Canon 350D, but it proved to be too heavy for the Meade ETX-105, and so he realised he would also need a converter. He bought a Meade colour converter, but the chip was too small, so he upgraded the telescope. The mount was not stable enough and had plastic micro-gears. The replacement telescope was a Meade LX200R, a 10" reflector, with a Meade 5000 series 26mm eyepiece.

With this new kit Richie was able to obtain a beautiful view of the night sky, but it was not good enough for imaging because it did not have a wedge and with a focal ratio of f/10 was rather slow. He began to guide the scope with a Williams Optics Zenithstar 66, which gave a better focal ratio of f/5.9. The Zenithstar 66 was used for images of the 2007 lunar eclipse and a wide-field image of the Andromeda Galaxy.

Now Richie could obtain better images of deep sky objects and had soon imaged the Great Orion Nebula again and also the Ring Nebula. Guiding was not required but, for better results, in 2008 he used a focal reducer to produce a guided image of the Orion Nebula. Richie had now gained experience of tracking and could image objects he could not see with the naked eye.

Richie told us about some of the mistakes he had made, some of them perhaps rather costly. At first he had not really learned his way around the sky, and without GoTo software a lot of time was wasted finding the target objects. At times he had had the wrong mounts. The LX200R had a fork mount with an equatorial wedge. The motor on the ETX was too weak. With a single scope and without an accurate drive it is not possible to take 5 to 10 minute exposures.

The Meade LX200R and the Williams Optics Zenithstar 66 had mismatched focal lengths. A temporary solution to this problem was to take images with the LX200R and to use the Zenithstar 66 for guiding.

The ongoing problems caused by the length of time taken to set up and take down equipment were eliminated when Richie constructed a custom-built observatory. The observatory roof was a roll-on roll-off design. The construction is somewhat over-engineered, but as Richie can now start imaging only 5-10 minutes after deciding the sky is clear enough - largely the time taken for the computer to start up - the advantages are obvious. Having a permanent set-up in the observatory means that his kit is no longer cluttering up the house.

Richie was now at the 'Coming of Age'

(Continued on page 11)

Cornish Schoolchildren Introduced to the Wonders of Astronomy and Physics

When the co-ordinating teachers at St Columb Major School wanted to run a science evening for the Gifted and Talented Children from the Newquay Area Cluster of Junior Schools , they approached Brannel Astronomy for help.

Members of the astro-club prepared a programme of mini-events to give these children a taste of astronomy and related subjects.

Obviously, this programme would be based around observing the night sky. However, bearing in mind the Cornish weather–where it has more than its fair share of cloud, it was necessary to have a parallel series of activities, just in case.

It was decided that the topics would be:

- Basic Optics and Telescope Design
- Constellations
- The Moon and its Feature
- Photography
- Gravity and the Pendulum

Nick Tonkin explaining how club members took their images

Apart from the pendulum experiment, the other four subjects would be covered under both clear and cloudy conditions, although with a different approach for each.

Frank Johns shows the finer points of a 6inch reflector

The event was held at St Columb Major School and 22 pupils from about 9 schools in the area attended.

Inevitably the evening was clouded in, so the children were split into five groups, with each group spending about half-hour on each of the five topics.

Mike Thompson 'unravelling' a pendulum

In addition to the children there were quite a few parents, carers and teachers–all of whom seemed to enjoy it as much as the children.

In addition to the subject leaders, other members of Brannel Astronomy were in attendance to answer queries and to generally assist.

The evening closed at about 9.30pm and whilst we were packing away the telescopes and the rest of the paraphernalia, the skies cleared and the Moon, Mars and the rest shone down brightly. This was very frustrating because by then all the children had dispersed. However we did spend some time pointing out interesting celestial objects to some of the teachers who remained. 'Ooh I've just seen Mars' one of them was heard to exclaim.

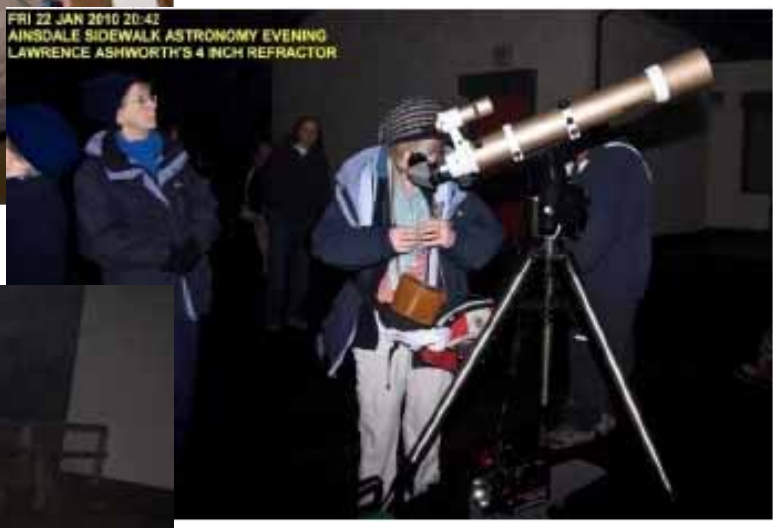
The feed back for this event was excellent, and it is likely that this will become an annual event. Also several of the schools in attendance asked if we could organise star parties at their schools. So we could well be busy.

We would like to congratulate Mr Haines and Mrs Christophers for organising the event and giving Brannel Astronomy the opportunity to shore our passion for astronomy with the next generation.

Phil Brotherwood

Is that really a Bear? Learning about constellations from Brian Sheen

More images from the Liverpool AS—Star Party at Ainsdale Discovery Centre



Images by Jim Stacey and Alan Dennott

THE UNLUCKY TELESCOPE by Graham Boots

Within the Equatorial Group of six astronomical observatories at the Observatory Science Centre at Herstmonceux in East Sussex, once the home of the now ceased Royal Greenwich Observatory (RGO), sits a strange telescope in Dome F.

This telescope has never been used and is known as the 38" Congo Schmidt Telescope that today is displayed as a museum item.

This telescope was made in 1960 by Cox, Hargreaves & Thomson (optics) and the original mounting by H D Barlow Ltd. It was destined for an observatory in Elisabethville in the then Belgian Congo, but civil war there prevented its delivery. It languished until 1972 when it was taken over by the RGO and set up in Dome F, in order to fulfil the long term wish to have a wide-angle (Schmidt camera) telescope on this site.

The optical system is complex. It is a Dall-Kirkham with ellipsoidal primary mirror. The primary mirror has an aperture of 960mm (38") and a focal length of 1930mm (76"). The prime focus thus has a focal ratio of 2. The optical light path can be adapted to be a f/10 Cassegrain or a f/10 Coude (relayed Cassegrain). A Coude focal point is static and therefore does not move with the telescope.

This is useful to mount large or heavy instruments. By using two inbuilt hinged down corrector lenses, the f/2 primary focus can be made to perform as a f/3 Schmidt or act as a spherical mirror (focal ratio 1) Short focal ratios can give a wider field of view. The main mirror is a solid piece of glass and the optical surface has been coated with aluminium to give it high reflectivity.

The main mirror (1) catches light and focuses it onto a photographic plate (2). At the top of the tube a special lens known as a corrector plate (3) ensures that the telescope should produce a sharp image over a wide a field of view. This optical system is called 'Schmidt camera' after its inventor in the 1930s.

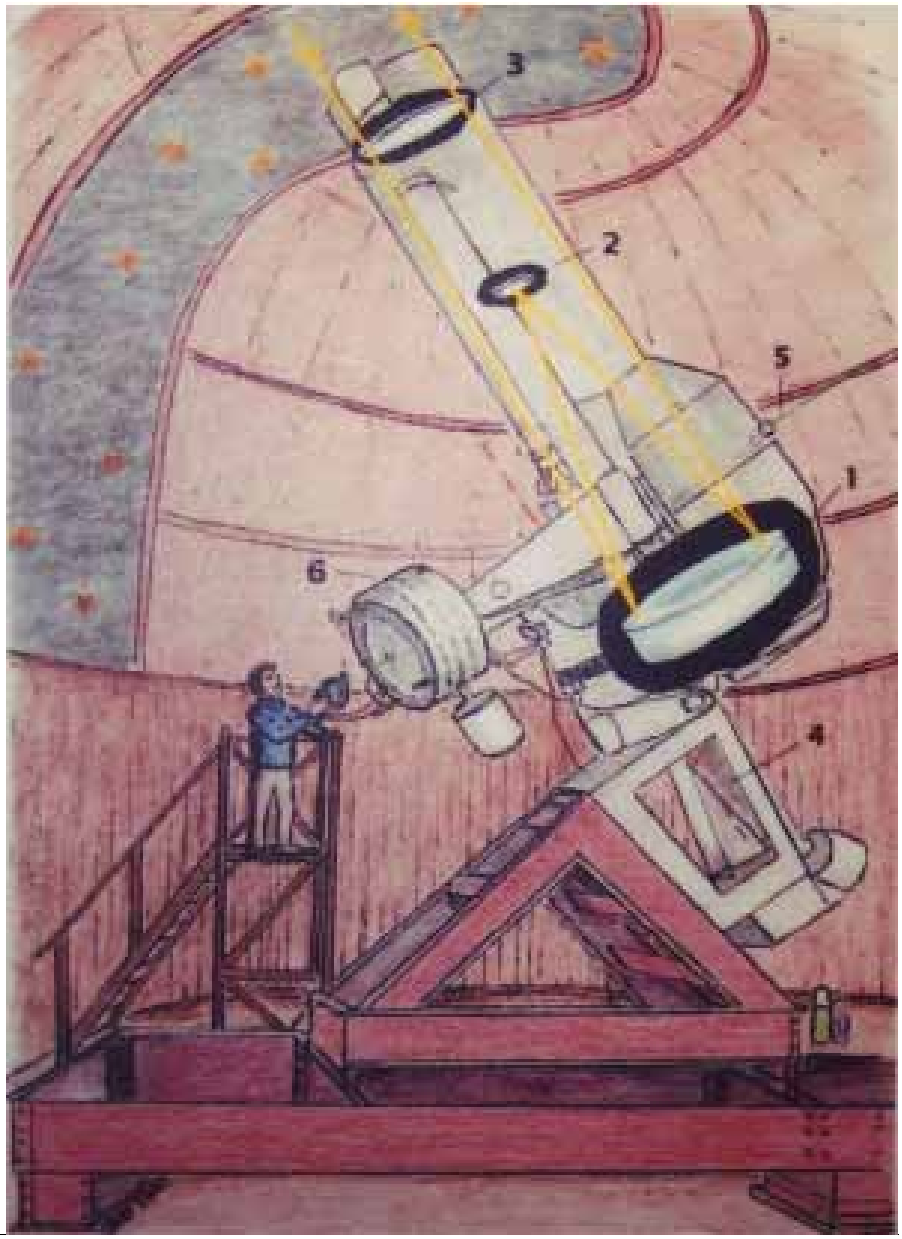
Tests were carried out upon the telescope and it was found that it was of no use for serious astronomical work. This was due to the main mirror having warped slightly because of stresses inside it, probably due to imperfect heat treatment when the glass blank was cast. The distortions were very slight, just a few thousandth of a millimetre, but it had to be rejected.

The telescope equatorial mounting system had been designed to operate at latitude 12° south (Elisabethville). For it to be used at Herstmonceux (latitude 51° north) the telescope had to have specially made girder work (painted red) for the whole telescope structure to sit upon.

After it became apparent that the mirror was defective it was discovered that no funds were available to correct it so the whole telescope became nothing more than a museum piece. One can only guess at the money wasted and all the frustrations over all those years.

How unlucky was that ?

Article courtesy Worthing AS



The Crater Alphonsus
By John Knott

On the floor of the crater Alphonsus are several dark spots some being suspected of variability. If you look at the line drawing below you will see discrepancies between the various observers.

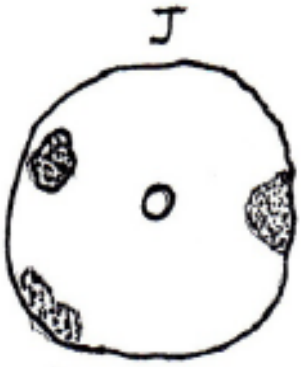
My own drawing shows the three spots that are always visible, I say always visible because every time I have observed the floor of Alphonsus they have been there, I have shown them as quite dark but at other times they have been lighter in appearance. These and other spots appear darker through a light blue filter.

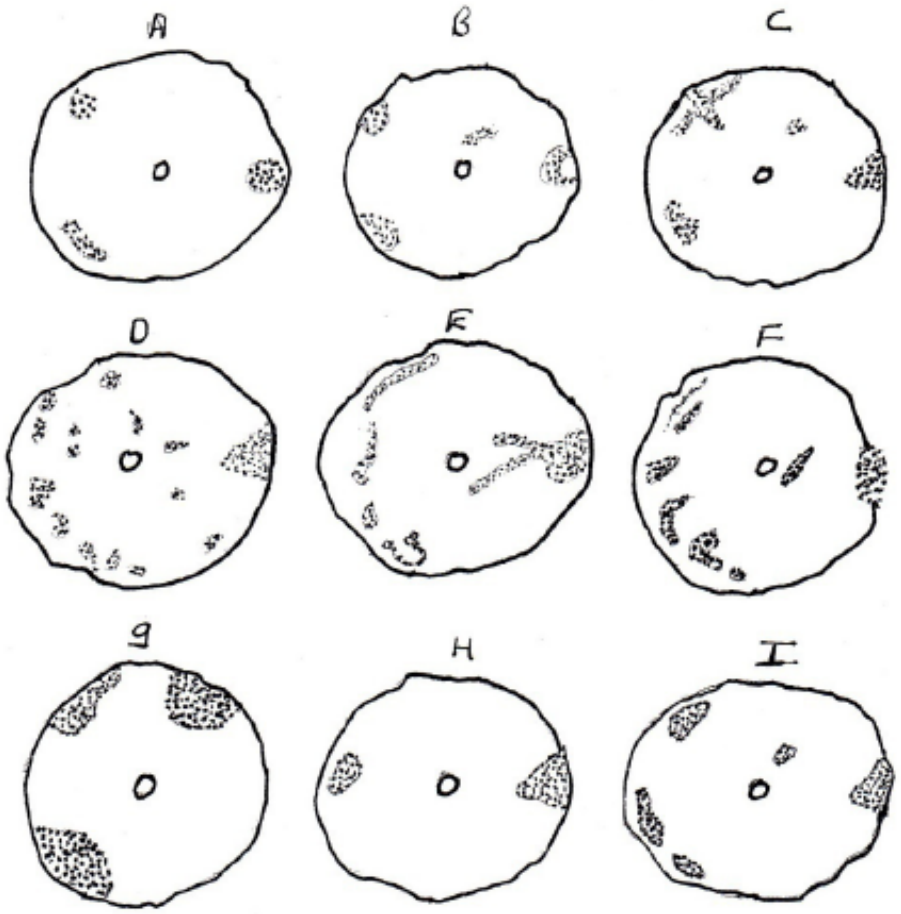
These seven drawings are done in a very simple manner just to show the spots, in actual fact the floor of

Alphonsus is very complex, dark shadows cast by the central peak and the terrain of humps and bumps

can make observing very difficult when trying to locate these dark spots.

This could be a good project for those who use webcams etc.





Dark spots within Alphonsus from various observers
A, B, C & E – Pickering
D - Fauth
F - Lohrmann
G - Schmidt
H - Neison
I - Mount Wilson 100-inch
J – Knott

Article courtesy LAS News Circular

How about sending your images in to the Newsletter?–Ed

(Continued from page 7)

stage of his journey. He sold some of his old equipment, including the Meade LX200R. Instead Richie bought a second-hand EQ6 mount, a Starlight Xpress SXV-H9 camera, a new GSO 6" Newtonian f/5 scope, a manual filter wheel and Baader RGB filters. With this equipment fewer dark frames [images taken in the dark for the purpose of improving the quality of the subject images] and flat frames [compensate for variations in pixel sensitivity] are needed.

Another advantage of Richie's new configuration is that it is modular, so he could buy what he needed and add it to the setup later. Richie was now observing remotely from the comfort of the house.

So far Richie has used the following scopes on the EQ6 mount - the GSO 6" Newtonian reflector, a GSO 8" Newtonian reflector, the Williams Optics Zenithstar 66, an Astro Professional 102ED refractor and an SCT Celestron C8 guide scope.

With the GSO 6" Newtonian Richie has imaged, amongst other objects the Bubble Nebula and the Crescent Nebula using Baader RGB filters.

With the Williams Optics Zenithstar 66 he has imaged the Flame and Horsehead Nebula and the Andromeda Galaxy with Hydrogen Alpha and OIII filters.

With the Astro Professional 102ED Richie has imaged the Dumbell Nebula amongst others. Using the Celestron C8 he has imaged the Crab Nebula building up a composite of images taken over a period of 3 to 4 months.

Other subjects that Richie has imaged include the Elephants Trunk Nebula, the Whirlpool Galaxy and the Triangulum Galaxy.

Richie showed us an image of his current set-up in which one scope is used for the images and the other does the guiding. Apart from the scopes already referred to he still has the Canon 350D camera, a Manfrotto Quick Release adaptor, the Synta EQ6, a Trutech filter wheel, the Starlight Xpress SXV-H9 camera, an SX Guidehead camera, Blinky dew heaters and a custom pier.

If what Richie does sounds complicated, he reassured us that he is, in effect, only following a routine. It's simply a longer list of steps to be followed than for visual observing. The procedures are written down and followed each time and it is now second nature to Richie, who built up his knowledge as he went along.

For the future, Richie would like to have another telescope and has in mind a second-hand Genesis NP101 f/5 to obtain a wider field of view, and which would be a bit faster than his current equipment.

At the end of his informative and entertaining talk, Richie told us that his observatory, South Common observatory, is at South Chailey, and visitors are welcome by arrangement. Richie also provides tuition in imaging for those interested. Details and many of Richie's images can be found at www.deepsky.org.uk.

In the meantime his journey continues, aided by an understanding wife and an occasional evening of line dancing.

Richard Godley

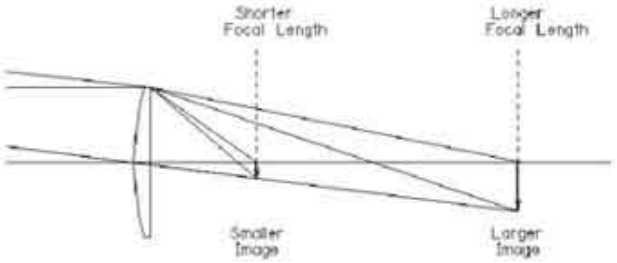
A QUESTION OF MAGNIFICATION

Trefor Harries

The concept of magnification is not always simple to interpret. For example, how often have we been asked "What magnification is that ?" when showing a photograph of an astronomical object to an enquirer with a casual interest ? When referring to the magnification of a telescope being used visually, the interpretation is simple enough; it is the increase in the angular diameter of an object when seen through the instrument compared to when it is viewed by the unaided eye. However, when referring to media images which have been produced by various optical arrangements the concept of magnification is sometimes more difficult to define. For example, what would be the magnification of a SPC900 webcam at the prime focus of a 150mm F8 refractor ? In this case the question only has meaning when we know how the obtained image will be viewed. The image is produced on the CCD sensor, then read out as a digital signal into some file format, which will then be input into some software to interface with any one of a number of display devices, e.g. a monitor screen or a printer, each of which will process the digital signal in its own way. These various translation processes can result in different image scales on the final viewing medium. The final size depends not only on this whole process but also on where the observer is positioned relative to the viewing medium, i.e. how far the eye is from the monitor screen or the printed sheet.

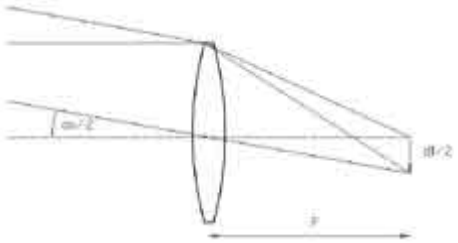
The first consideration would be to determine the image size resulting from the optical arangement used to produce it. For example, in the simplest case of a prime focus image, the image size is determined by the angular diameter of the target object and the focal length of the lens or mirror; the longer the focal length the larger the image as depicted in Fig. 1.

Fig. 1 : Image Size And Projection Distance



Prime Focus Image Size

Fig. 2 : Image size at prime focus

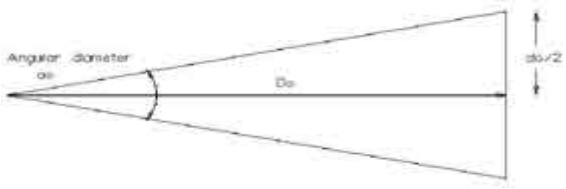


From Fig. 2 : $d_I = 2 F \tan (a_o / 2)$ ..... (1)

where d_I is the diameter of the prime focus image
F is the focal length of the lens / mirror
and a_o is the angular diameter of the object

Angular Diameter To Naked Eye

Fig. 3 : Naked Eye Angular Diameter



From Fig. 3 the angular diameter of the object is :

$$a_o = 2 \tan^{-1} \left[\frac{d_o}{2D_o} \right] \quad \text{..... (2)}$$

where a_0 is the angular diameter of the naked eye object
d_o is the diameter of the object
and D_o is the distance of the object

Substituting for a_o from (2) into (1) :

$$d_I = 2 F \tan \left[\tan^{-1} \left[\frac{d_o}{2D_o} \right] \right]$$

$$d_I = \frac{F d_o}{D_o} \quad \text{..... (3)}$$

This gives the prime focus image diameter from the distance and size of the object.
Taking the Moon as an example :
Diameter of Moon (=d_o) = 3476.6 Km
Distance of Moon (=D_o) = 384,400 Km

So image diameter at prime focus for a 1200 mm focal length is :

$$d_I = \frac{1200 \times 3476.6}{384400} = 10.85 \text{ mm}$$

For images of astronomical objects two simplifications can be made :

(1) All object distances can be regarded as infinity and this is implicit in all quoted angular diameter figures so equation (2) does not need to be used.

(2) Object diameters are usually small and equation (1) can be approximated by the small angle formula :

$d_I = a_o F$ (a_o in radians) or :

$$d_I = \frac{a_o F}{57.3} \quad (a_o \text{ in degrees}) \quad \text{..... (4)}$$

We can then use the listed angular diameter of our target object, and the above calculation can then be made more simply using (4). For the Moon :

$$a_o = 0.518° \text{ so } d_I = \frac{0.518 \times 1200}{57.3} = 10.85 \text{ mm}$$

Once the primary image size has been calculated and any scaling factors inherent in the transcription onto the viewing medium have been determined, then the size of the reproduced image is known. Of course we do not always need to go through this process; if we have a photograph, for example, we can just measure it with a ruler, but if an illustration to a specific scale is required, or, say, a field-of-view graticule is to be superimposed on the picture, then the final image scale may need to be accurately known.

There are many situations which add their own subtleties to the consideration of image scale. For example, analog SLRs often came with a standard lens of about 55 mm focal length as this gave an image which, when viewed in the viewfinder, approximated the image size produced by the naked eye. Although this is still an indirect comparison since the image is first projected onto a ground glass screen then viewed through a lens which produces its own magnifying effect, it forms a standard by which other lenses can be compared using their focal length, since the image size will vary directly with the focal length. For example a telephoto lens of 110 mm focal length will produce an image of exactly twice the linear size of the standard lens on such a camera. This provides an indication of the power of the lens but, of course, the size of the final image will depend on how it is viewed, i.e. on the degree of enlargement during printing, or, for example, if it is a slide, the distance between the projector and screen when displaying it. If it is viewed on a computer screen then the picture editor software used will supply enlargement on its own initiative or as directed by the user.

Interpreting a magnification for a printed image demands that the angular diameter of the viewed image be compared with the angular diameter of the real object. The first depends upon the distance of the printed image from the eye, and the second, the distance of the object as originally viewed. Generally then, a printed image or photograph cannot have a unique magnification associated with it without specifying both these distances. However, for an object that is located effectively at infinite distance the situation is somewhat simpler in that only the image to eye distance needs to be defined. Most people, when viewing a print will place it at about 25 cm from their eye, so this could possibly be used as a standard. As an example lets say we have a photograph of the full moon on which the moon's disc is 10 cm in diameter. If we

accept the previous figure of 25 cm as a standard viewing distance then we can easily ascribe a magnification to the picture.

The angular diameter of the full moon is approx 0.5°.

The angular diameter of the moon's disc on the photograph is given by figure 3 / equation (2) :

Angular diameter of image = $2 \tan^{-1} (5 / 25)$ = 22.6°.
And the magnification = 22.6 / 0.5 = 45.2

And generally, the equivilent magnification of a printed image is :

$$M = \frac{2 \tan^{-1} [d / (2D)]}{a_o} \quad \text{..... (5)}$$

where d = diameter of object in image
D = distance of print from eye
a_o = angular diameter of naked eye object

Let's now apply this to the question posed at the beginning of this article i.e. the magnification provided by an SPC900NC webcam on a 1200 mm refractor as the image is seen on a 1280 x 1024 computer screen. Just as an example I photographed a chain link fence using this arrangement and obtained the following measurements :

The actual width of one chain link was 48 mm.
The width of one link as displayed on the screen was 80 mm.
The distance from the viewpoint was 32 metres.

Actual angular diameter of one link = $2 \tan^{-1} (48 / 64000)$ = 0.086°
Angular diameter of one link in image when viewed at 25 cm = $2 \tan^{-1} (80 / 500)$ = 18.18°
So equivilent magnification when viewed onscreen = 18.18 / 0.086 = 211
Employing these considerations then, we should be able to sensibly ascribe a figure for the magnification of a viewed image in any specific situation.
As an example of a possible application of all this, let's suppose we want to use some images of astronomical objects to simulate the view we would expect to get through a particular telescope-eyepiece combination. We would have the following information to start with :

Angular diameter of object = a_o °
Focal length of eyepiece = f mm
Linear diameter of object in image = d mm
Apparent field of view of eyepiece = v °
Focal length of telescope = F mm
Length of side of picture = L mm

We can calculate :
Magnification (M) = F / f
Image scale (S) = a_o / d (° mm)
Actual field of view (V) = v / M
Picture width (W) = S L

We could construct a field-of-view overlay from the calculated image scale. For a field of view circle of N° the circle will be N / S mm in diameter. The angular diameter of the full field, i.e. the picture size, will be W = $2 \tan^{-1} [L / (2 x 250)]$ assuming our standard 25 cm viewing distance, and this could be adjusted for a convenient scale. An important point to note here is that it is often difficult to accurately measure the object diameter on an astronomical image. This is because most objects, especially deep sky objects, do not have well-defined boundaries, and the size as it appears on an image may depend as much as anything else on the exposure time of the photograph. If there were two identifiable stars in the frame this would facilitate calibration. For our example let's say we have an image of the Pinwheel Galaxy M101 in Ursa Major. This is listed as 28 arc mins in diameter. Let's say the image diameter is 20 mm on a 100 mm picture. We calculate :

S = a_o / d = 28 arcmins / 20 mm = 1.4 arcmins / mm
W = S L = 1.4 x 100 = 140 arcmins

and our 1° FOV overlay circle will be :
N / S = 60 / 1.4 = 43 mm in diameter.

Below is shown one example of a simulated view through a x40 eyepiece which has an apparent field of view of 52°. The actual field of view is 52 / 40 = 1.3°.

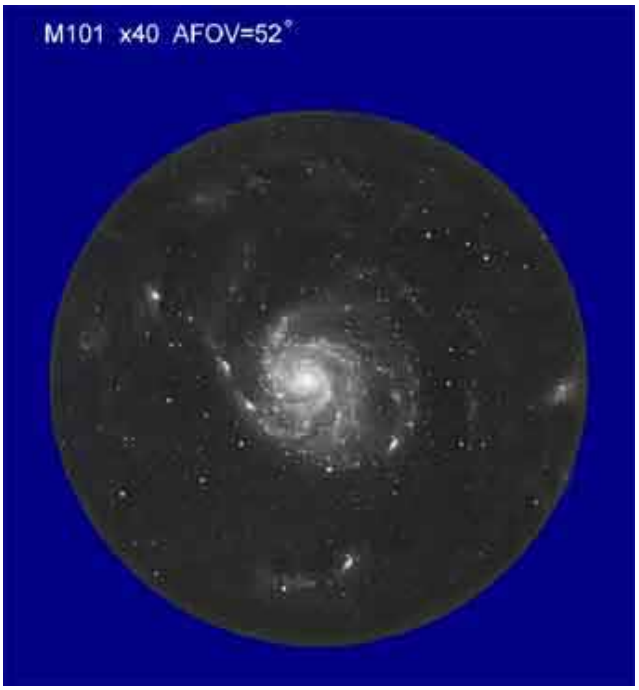
In this image a field stop has been incorporated using the diameter calculated from the actual field of view (V) and the image scale (S). Notice that there are two possible interpretations to the magnification here. There is the actual image magnification, i.e. the angular diameter presented to the viewer by the image compared to that presented to the naked eye; then there is the simulated magnification, i.e. that experienced by an observer looking through the eye-piece, and depicted by the size of the displayed object relative to the field of view and any superimposed FOV circle, the size of the image reflecting only the image scale used. These could be made equal, if desired, by adjusting the image scale. The first magnification is given by equation (5), and the second we know to be x40 so to equalise them :

$$\frac{2 \tan^{-1} [d / (2D)]}{a_o} = 40$$

from which d = 500 tan [40 a_o / 2] = 82 mm

so the image scale needs to be :

S = a_o / d = (28 / 60) / 82 = 0.0057° mm = 0.34 arcmins/mm



Note that one thing this simulator will not portray is the brightness of the object. This might be well illustrated by our particular example of M101 which is a notoriously dim object and needs a very dark sky to make its appearance !

Magnification For A Full-FOV Object

It may often be useful to know the magnification required for the target object to just fill the field of view of the optics.

F_t = true field of view
F_a = Apparent Field of view
A_o = Angular diameter of object
M = Magnification
For the object to fill the field of view :

$F_t = A_o$
so $F_a / M = A_o$
and $M = F_a / A_o$

More generally, the proportion (P), of the apparent field of view taken by the object is :

$$P = A_o / F_t = A_o M / F_a$$

So, for example if the disc of the full Moon is required to take 75% of the field of view, and we are using an eyepiece which has an apparent field of view of 70° the required magnification will be

$$M = P F_a / A_o = 0.75 \times 70 / 0.5 = 105.$$

Astronomers See Historical Supernova from a New Angle

Since Galileo first pointed a telescope at the sky 400 years ago, a myriad of technological advances have allowed astronomers to look at very faint objects, very distant objects, and even light that's invisible to the human eye. Yet, one aspect usually remains out of reach -- the benefit of a 3-D perspective.

Our telescopes show the Milky Way galaxy only as it appears from one vantage point: our solar system. Now, using a simple but powerful technique, a group of astronomers led by Armin Rest of Harvard University has seen an exploding star or supernova from several angles.

"The same event looks different from different places in the Milky Way," said Rest. "For the first time, we can see a supernova from an alien perspective."

The supernova left behind the gaseous remnant Cassiopeia A. The supernova's light washed over the Earth about 330 years ago. But light that took a longer path, reflecting off clouds of interstellar dust, is just now reaching us. This faint, reflected light is what the astronomers have detected.

The technique is based on the familiar concept of an echo, but applied to light instead of sound. If you yell, "Echo!" in a cave, sound waves bounce off the walls and reflect back to your ears, creating echoes. Similarly, light from the supernova reflects off interstellar dust to the Earth. The dust cloud acts like a mirror, creating light echoes that come from different directions depending on where the clouds are located.

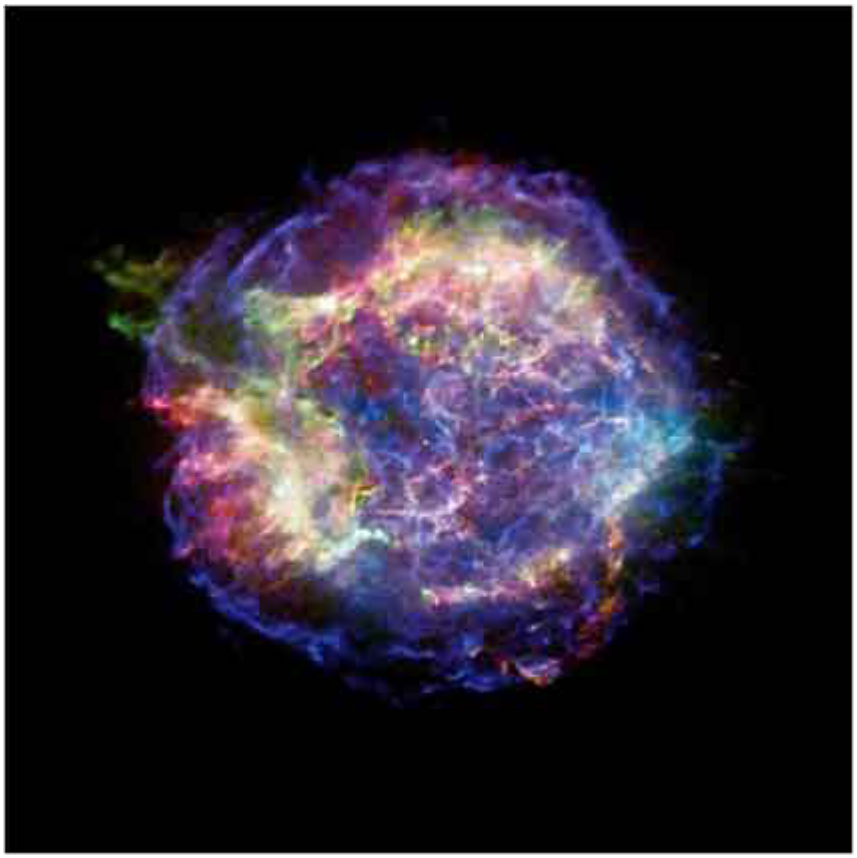
"Just like mirrors in a changing room show you a clothing outfit from all sides, interstellar dust clouds act like mirrors to show us different sides of the supernova," explained Rest.

Moreover, an audible echo is delayed since it takes time for the sound waves to bounce around the cave and back. Light echoes also are delayed by the time it takes for light to travel to the dust and reflect back. As a result, light echoing from the supernova can reach us hundreds of years after the supernova itself has faded away.

Not only do light echoes give astronomers a chance to directly study historical supernovae, they also provide a 3-D perspective since each echo comes from a spot with a different view of the explosion.

Most people think a supernova is like a powerful fireworks blast, expanding outward in a round shell that looks the same from every angle. But by studying the light echoes, the team discovered that one direction in particular looked significantly different than the others.

They found signs of gas from the stellar explosion streaming toward one point at a speed almost 9 million miles per hour (2,500 miles per second) faster than any other observed direction.



"This supernova was two-faced!" said Smithsonian co-author and Clay Fellow Ryan Foley. "In one direction the exploding star was blasted to a much higher speed."

Previous studies support the team's finding. For example, the neutron star created when the star's core collapsed is zooming through space at nearly 800,000 miles per hour in a direction opposite the unique light echo. The explosion may have kicked gas one way and the neutron star out the other side (a consequence of Newton's third law of motion, which states that every action has an equal and opposite reaction).

By combining the new light-echo measurements and the movement of the neutron star with X-ray data on the supernova remnant, astronomers have assembled a 3-D perspective, giving them new insight into the Cas A supernova.

"Now we can connect the dots from the explosion itself, to the supernova's light, to the supernova remnant," said Foley.

Cassiopeia A is located about 16,000 light-years from Earth and contains matter at temperatures of around 50 million degrees F, causing it to glow in X-rays. A 3-D computer model of the remnant is online.

The Mayall 4-meter telescope at Kitt Peak National Observatory was used to locate the light echoes. Follow-up spectra were obtained with the 10-meter Keck I Telescope.

ScienceDaily (Mar. 31, 2010)

Three Craters

This computer graphic shows three craters in the eastern Hellas region of Mars, containing concealed glaciers that were detected by radar.

The image was created using image data from the Context Camera on the Mars Reconnaissance Orbiter (MRO) spacecraft combined with results from the SHARAD radar sounder on MRO and HRSC digital elevation map from the Mars Express spacecraft. The color of the Martian surface and ice was estimated from MRO HiRISE color images of other Martian craters and the polar ice caps.

Recent measurements from MRO's SHARAD radar sounder have detected large amounts of water ice in such deposits over widespread areas, arguing for the flow of glacial-like structures on Mars in the relatively recent geologic past.

This suggests that snow and ice accumulated on higher topography, flowed downhill and is now protected from sublimation by a layer of rock debris and dust. Furrows and ridges on the surface were caused by deforming ice.

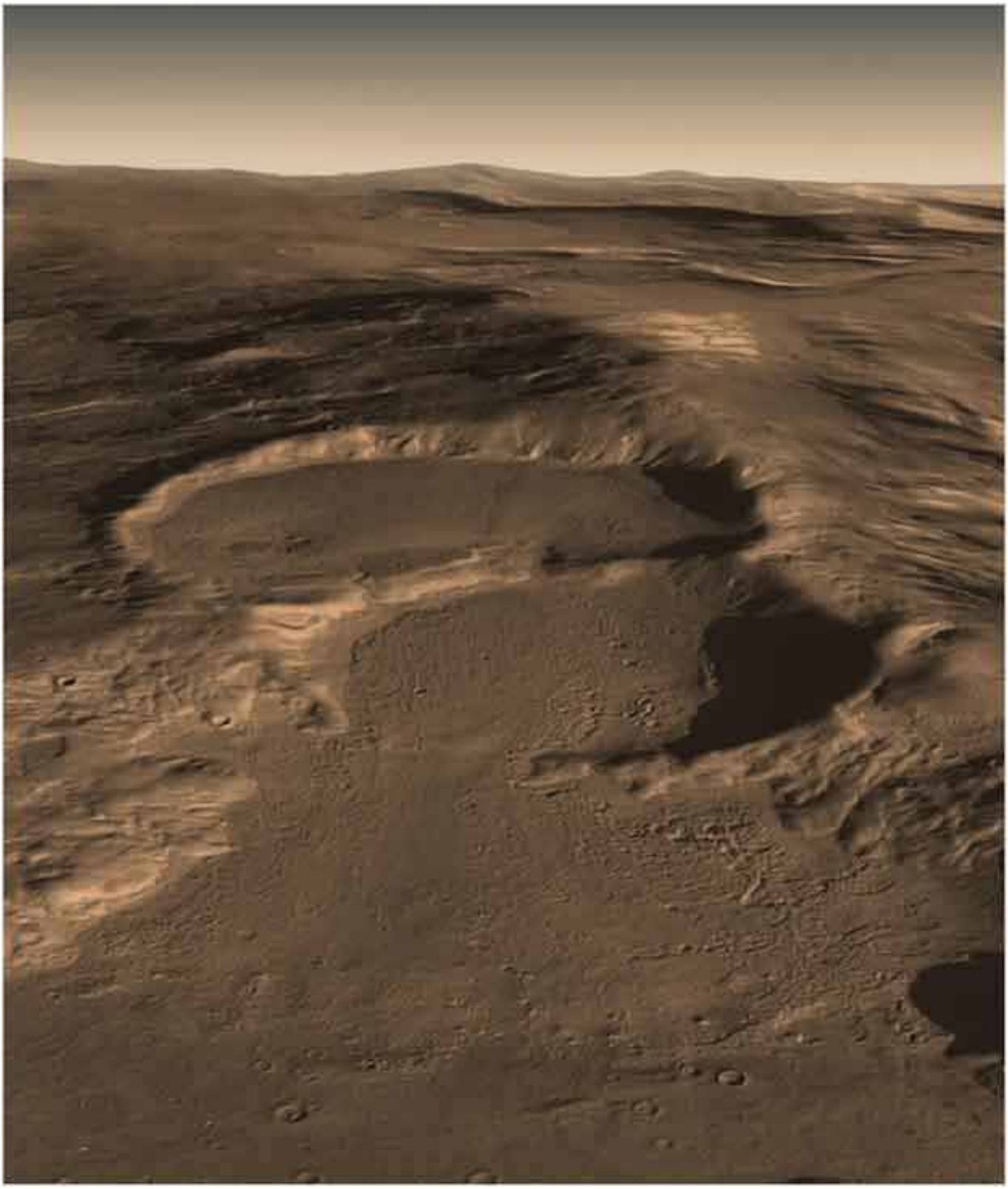


Image Credit: NASA/JPL-Caltech/UTA/UA/MSSS/ESA/DLR/JPL Solar System Visualization Project

One Small Step Backwards, But A Giant Leap For China & India.

By Gerard Gilligan.

On the day NASA remembered the seven astronauts killed in the 2003 Columbia shuttle disaster, the administration of US President Obama unveiled a new budget plan for America manned spaceflight.

The plan which is part of the overall USA budget proposals of $3.8 trillion, (£2.4 trillion) will see the cancellation of the Constellation programme, to return US astronauts to the Moon by 2020. This plan had been examined by the Augustine Committee at the end of 2009, and was found to be woefully under funded for its major goals, and it was believed that it would fail.

Despite this cancelling of a program which has already cost $9 billion, the new funding plans increases NASA's overall funding by $6 billion for the next five years to a total of $100 billion.

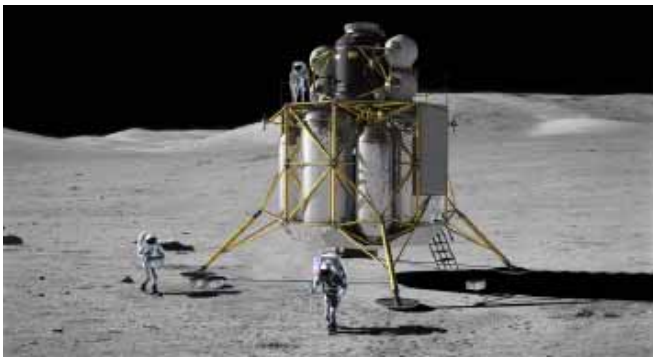
This new plan for human spaceflight, which has yet to be agreed by the US Congress, will see funding increased to develop new technologies that could enable future human missions to the Moon, near-Earth asteroids, and Mars. But for this there is no timescale or named target that has been indicated. However it would be private industry that would provide the hardware for ferrying humans to low-Earth orbit, and it would extend US participation in the International Space Station (ISS) up to 2020. The ISS was only to be supported by the USA until 2016.

NASA's current mission for space exploration was spelt out about five years ago by President George W. Bush in his "Moon, Mars, and Beyond". With the space shuttle program due to finish later this year, the Constellation program was to be its successor, a system to enable astronauts to travel to Earth orbits using the Orion vehicle, and the new rocket, which has already been tested the *Ares 1*. A new heavy lift rocket called *Ares V* was also under development which was to be used to transport crews, supplies and hardware for a lunar base, and to take crews on year long trips to Mars and even beyond into the outer parts of the solar system. However under these new plans a return to the Moon was to be a first step, which would not happen until 2028 at the earliest and this may only be possible using better international cooperation with funding and the supply of hardware, which has been done with regard to the ISS.

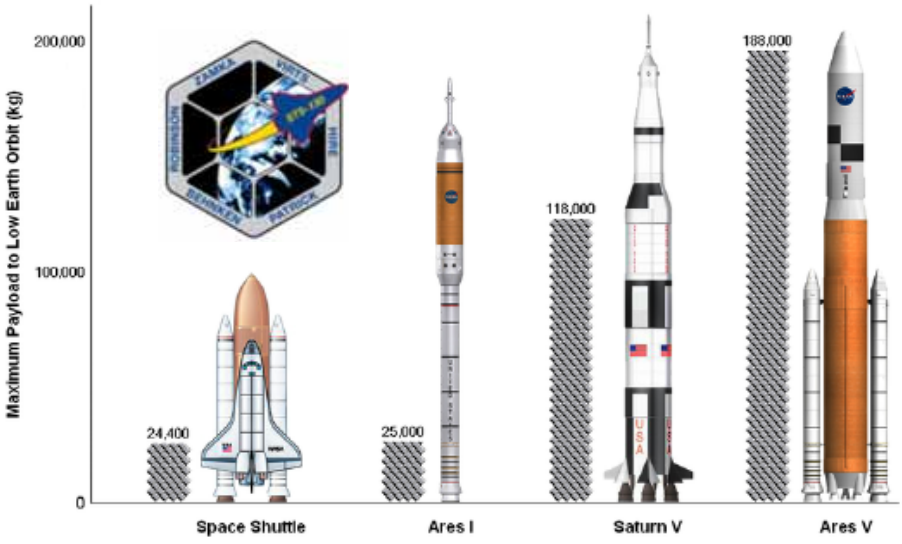
However these plans from the current US administration open the road into space, the Moon and beyond to other countries, like Russia, which is still using rocket technology design in the early 1960's, and will soon be joined by China. China has ready shown the world that it has the hardware to place humans into low-Earth orbit, and hopes to place its own space station into orbit within the next five years. India has also recently announced plans to have its own astronauts in space by 2016, and like China has its eyes also on landing humans on the Moon by 2020. Sadly during this period in time the USA and NASA will have taken a step backwards and be developing rockets that at the moment only exist on paper.

The Proposed "Altair" Lunar Module for the USA return to the Moon in 2020, which will sadly now remain an artist's impression.

Meanwhile the space shuttle Endeavour was successfully launched from the Kennedy Space centre on February 8th, on what was the very last night-time shuttle launch. The shuttle docked two days later with the station. The 13 day mission will see the seven member crew deliver new supplies, and hardware to the current crew of ISS. Plus a new front porch called "Cupola" which will provide excellent views of Earth from orbit. They will also install the Node 3 – "Tranquillity" module, which will give the ISS a new multiple docking ports for visiting spacecraft, and future ISS modules, and provide the station with a new life support system.



Endeavour's seven crew members include Yorkshire born mission specialist Nicholas Patrick. He will be involved in three spacewalks to install the two new modules to the ISS. The shuttle is due to return to Earth around the 21st – 22nd February.



Article courtesy of Liverpool AS

Ashes to Ashes, Dust to Dust: Space Telescopes Image Remains of Collapsed Star

A new image from NASA's Chandra and Spitzer space telescopes shows the dusty remains of a collapsed star. The dust is flying past and engulfing a nearby family of stars.

"Scientists think the stars in the image are part of a stellar cluster in which a supernova exploded," said Tea Temim of the Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass., who led the study. "The material ejected in the explosion is now blowing past these stars at high velocities."

The composite image of G54.1+0.3 is online athttp://photojournal.jpl.nasa.gov/catalog/?IDNumber=pia12982 . It shows the Chandra X-ray Observatory data in blue, and data from the Spitzer Space Telescope in green (shorter wavelength) and red-yellow (longer). The white source near the center of the image is a dense, rapidly rotating neutron star, or pulsar, left behind after a core-collapse supernova explosion. The pulsar generates a wind of high-energy particles -- seen in the Chandra data -- that expands into the surrounding environment, illuminating the material ejected in the supernova explosion.

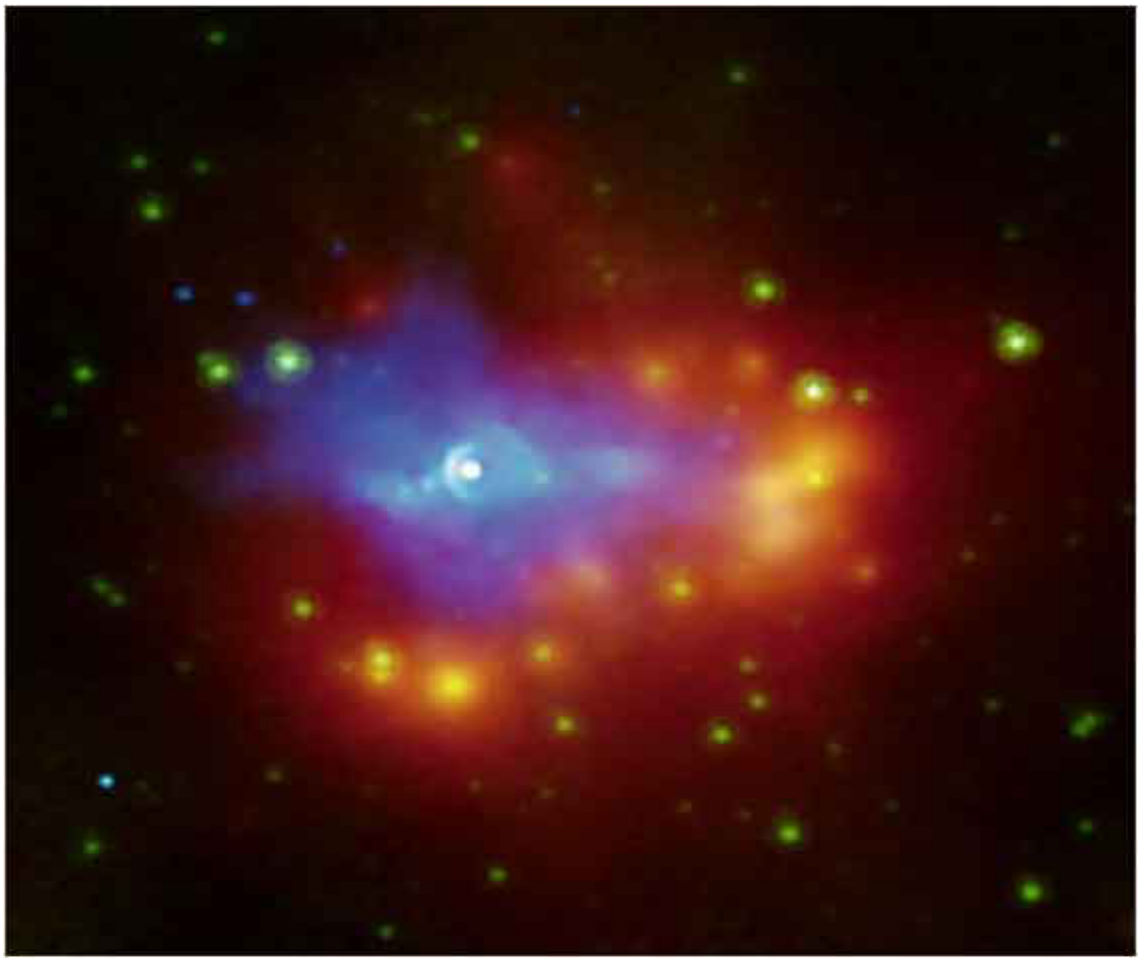
The infrared shell that surrounds the pulsar wind is made up of gas and dust that condensed out of debris from the supernova. As the cold dust expands into the surroundings, it is heated and lit up by the stars in the cluster so that it is observable in infrared. The dust closest to the stars is the hottest and is seen glowing in yellow in the image. Some of the dust is also being heated by the expanding pulsar wind as it overtakes the material in the shell.

The unique environment into which this supernova exploded makes it possible for astronomers to observe the condensed dust from the supernova that is usually too cold to emit in infrared. Without the presence of the stellar cluster, it would not be possible to observe this dust until it becomes energized and heated by a shock wave from the supernova. However, the very action of such shock heating would destroy many of the smaller dust particles. In G54.1+0.3, astronomers are observing pristine dust before any such destruction.

G54.1+0.3 provides an exciting opportunity for astronomers to study the freshly formed supernova dust before it becomes altered and destroyed by shocks. The nature and quantity of dust produced in supernova explosions is a long-standing mystery, and G54.1+0.3 supplies an important piece to the puzzle.

NASA's Marshall Space Flight Center in Huntsville, Ala., manages the Chandra program for NASA's Science Mission Directorate in Washington. The Smithsonian Astrophysical Observatory controls Chandra's science and flight operations from Cambridge, Mass.

The Spitzer observations were made before the telescope ran out of its coolant in May 2009 and began its "warm" mission. NASA's Jet Propulsion Laboratory in Pasadena, Calif., manages Spitzer for NASA's Science Mission Directorate, Washington. Science operations are conducted at the Spitzer Science Center at the California Institute of Technology in Pasadena. Caltech manages JPL for NASA.



More information on the Spitzer Space Telescope is online at:
http://www.spitzer.caltech.edu/spitzer and http://www.nasa.gov/spitzer .
More information on the Chandra X-ray Observatory is at:
http://chandra.harvard.edu and http://chandra.nasa.gov .

ScienceDaily (Apr. 1, 2010)

Mars Rovers in the news

Spirit May Have Begun Months-Long Hibernation

NASA's Mars Exploration Rover Spirit skipped a planned communication session on March 30 and, as anticipated from recent power-supply projections, has probably entered a low-power hibernation mode.

In this mode, the rover's clock keeps running, but communications and other activities are suspended in order to put all available energy into heating and battery recharging. When the battery charge is adequate, the rover attempts to wake up and communicate on a schedule it knows.

tunity is currently on a long-term trek toward a large crater named Endeavour.

Spirit had been communicating on a once-per-week schedule in recent weeks. During the designated time for the rover to communicate with NASA's Mars Odyssey orbiter passing overhead on March 30, Odyssey heard nothing from the rover.

"We are checking other less-likely possibilities for the missed communication, but this probably means that Spirit tripped a low-power fault sometime between the last

"We may not hear from Spirit again for weeks or months, but we will be listening at every opportunity, and our expectation is that Spirit will resume communications when the batteries are sufficiently charged," said John Callas of NASA's Jet Propulsion Laboratory, Pasadena, Calif., who is project manager for Spirit and its twin rover, Opportunity.

Spirit's power supply is low because daily sunshine for dusty solar panels is declining with the approach of the winter solstice, in mid-May, in Mars' southern hemisphere. In the three previous Martian winters that Spirit has survived since landing in January 2004, the rover was tilted northward to put its solar panels at a favorable angle toward the sun. That preparation was not possible this winter because of impaired mobility. Spirit's wheels are dug into soft sand, and the rover lost the use of a second wheel four months ago. It had previously lost use of one of its six wheels four years ago.

Spirit's original mission was planned to last for three months. The rover has worked extended missions since April 2004. Opportunity downlink on March 22 and yesterday," Callas said. "The recent downlinks had indicated that the battery state of charge was decreasing, getting close to the level that would put Spirit into this hibernation."

In coming weeks, Spirit's core electronics will become colder than any temperature they have ever experienced on Mars. Thermal projections indicate the temperature probably will not drop lower than the electronics were designed and tested to tolerate, but the age of the rover adds to the uncertainty of survival.

"The temperature limit was for a new rover. We now have an older rover with thousands of thermal cycles on Mars, so the colder temperatures will be a further stress," Callas said. JPL, a division of the California Institute of Technology in Pasadena, manages the Mars Exploration Rover Project for NASA's Science Mission Directorate, Washington.

For more information about the Mars rovers, visithttp://www.nasa.gov/rovers .

ScienceDaily (Apr. 3, 2010)

Opportunity Surpasses 20 Kilometers of Total Driving

NASA's Mars Exploration Rover used its panoramic camera to record this view of the rim of a crater about 65 kilometers (40 miles) in the distance, on the southwestern horizon. Image -- NASA's Mars Exploration Rover Opportunity today surpassed 20 kilometers (12.43 miles) of total driving since it landed on Mars 74 months ago.

The drive taking the rover past that total covered 67 meters (220 feet) southward as part of the rover's long-term trek toward Endeavour Crater to the southeast. It was on the 2,191st Martian day, or sol, of the mission and brought Opportunity's total odometry to 20.0433 kilometers. To reach Endeavour, the healthy but aging rover will need to drive about 12 kilometers (7.5 miles) farther.

Opportunity's mission on Mars was originally planned to last for three months with a driving-distance goal of 600 meters (less than half a mile).

Since landing, Opportunity has examined a series of craters on the plain of Meridiani, and the journey so far has covered a portion of the plain with negligible tilt. Now, the rover is approaching a portion tilting slightly southward. Recent images toward the southwest show the rim of a crater named Bopolu, about 65 kilometers (40 miles) away.

Meanwhile, Spirit, Opportunity's twin, is continuing minimal operations due to declining solar energy with the approach of winter in

Mars' southern hemisphere. Spirit has been communicating on schedule once per week. It is expected to drop to a low-power hibernation mode soon that could prevent communications for weeks at a time during the next several months.

NASA's Jet Propulsion Laboratory, a division of the California Institute of Technology in Pasadena, manages the Mars Exploration Rover Project for the NASA Science Mission Directorate, Washington.

For more information about the Mars rovers, visit http://www.nasa.gov/rovers.

Credit: NASA/JPL-Caltech/Cornell University PASADENA, Calif

“Roaming" Magnetic Fields Found

Weak "seed fields" may solve galaxy mystery

Weak magnetic fields are "roaming" across the universe, according to a new study that may have solved the mystery of where the huge magnetic fields around galaxies come from.

Galaxies such as our Milky Way have their own large-scale magnetic fields. Although these fields are weak compared to planetary fields, scientists think the galactic versions help establish rates of star formation, guide cosmic rays, and regulate the dynamics of interstellar gas.

Most scientists believe the stronger magnetic fields of today's adult galaxies grew from weaker "seed" fields. But it's unclear where these older fields originated.

The two leading theories: The seed fields were created by the movement of charged gas in protogalaxies, or they were produced outside of galaxies by some unseen processes in the early universe.

New observations made with NASA's Fermi Gamma-ray Space Telescopesupport the idea that the seeds were there all along, even *before* galaxies themselves.

(Related: "Gamma Ray Telescope Finds First 'Invisible' Pulsar.")

Based on Fermi's data, "we've found that these weak magnetic fields should be everywhere. They should be outside the galaxies, filling the whole universe, even where there are no galaxies, no clusters, no anything," said study co-author Andrii Neronov of the University of Geneva's ISDC Centre for Astrophysicsin Switzerland.

Since the new findings suggest magnetic fields can form outside galaxies, "perhaps those magnetic fields were created before the galaxies were formed," Neronov said.

Sowing the Seeds for Galactic Fields

According to the theory, primordial seed fields could have been created from charged particles spit out during violent events such as supernovae.

Over time, the theory goes, a seed field could bulk up inside a galaxy, because the galaxy's slow spin causes charged particles and gases to align along the seed's magnetic field lines.

(Related: "Earth's Core, Magnetic Field Changing Fast, Study Says.")

But other seed fields would remain roaming through intergalactic space–and that's what Neronov and colleagues think they've found.

More precisely, the team saw a lack of very high-energy gamma rays in Fermi data on blazars, galaxies with supermassive black holes at their centers that spew jets of particles at near the speed of light.

The gamma rays that reach Earth from blazars should be at a certain energy level. But the gamma rays Neronov's team saw appear to have been sapped of some of their strength, which is exactly what would have happened if the gamma rays had interacted with weak magnetic fields along the way.

"What we've detected could be this initial weak field, and that could resolve the problem of the origin of [modern] magnetic fields in the Milky Way and other galaxies, because we may now know the initial conditions," Neronov said.

Magnetic Mysteries Remain

The scientists aren't sure which high-energy processes might have created the very first magnetic fields in a young, galaxy-less universe, although there's no shortage of candidates.

(Related: "Earliest Known Galaxies Spied in Deep Hubble Picture.")

It's also unclear whether the roaming seed fields played a role in the subsequent formation of galaxies and galaxy clusters, since the fields' exact intensities have yet to be measured.

"In general, I tend to think that they do not play a significant role in the formation of the galaxies, because they are too weak" at the low levels the Fermi team observed, Neronov said.

Brian Handwerk
National Geographic News

Particle jets shoot from a galaxy's central supermassive black hole in an artist's rendering.

Small companion to brown dwarf challenges simple definition - Scientists used the Hubble Space Telescope and the Gemini Observatory to image the companion planet-like object, which has the same approximate age as its host brown dwarf.

Provided by STScI, Baltimore, Maryland

As our telescopes grow more powerful, astronomers are uncovering objects that defy conventional wisdom. The latest example is the discovery of a planet-like object circling a brown dwarf. It's the right size for a planet, estimated to be 5-10 times the mass of Jupiter, but the object formed in less than 1 million years – the approximate age of the brown dwarf – and much faster than the predicted time it takes to build planets according to some theories.

This is an artist's conception of the binary system 2M J044144 showing the primary brown dwarf that is estimated to be approximately 20 times the mass of Jupiter (at left) and its companion that is estimated to be 7 times the mass of Jupiter (at right). The disk of the primary likely never had enough material to make a companion of this mass. As a result, this small companion probably formed like a binary star. In this illustration, both objects are presented at the same distance to show relative sizes. Not shown are two other nearby objects, a low-mass star and a brown dwarf that are probably both parts of this system.

Gemini Observatory, courtesy of L. Cook

Kamen Todorov of Penn State University and co-investigators used the keen eyesight of the Hubble Space Telescope and the Gemini Observatory to directly image the companion of the brown dwarf, which was uncovered in a survey of 32 young brown dwarfs in the Taurus star-forming region. Brown dwarfs are objects that typically are tens of times the mass of Jupiter and are too small to sustain nuclear fusion to shine as stars do.

The mystery object orbits the nearby brown dwarf at a separation of approximately 2.25 billion miles (3.6 billion kilometers), which is between the distances of Saturn and Uranus from the Sun.

There has been a lot of discussion in the context of the Pluto debate over how small an object can be and still be called a planet. This new observation addresses the question at the other end of the size spectrum: How small can objects be and still be a brown dwarf rather than a planet? This new companion is within the range of masses observed for planets around stars – less than 15 Jupiter masses. But should it be called a planet? The answer is strongly connected to the mechanism by which the companion most likely formed.

There are three possible formation scenarios: Dust in a circumstellar disk slowly agglomerates to form a rocky planet 10 times larger than Earth, which then accumulates a large gaseous envelope; a lump of gas in the disk quickly collapses to form an object the size of a gas giant planet; or, rather than forming in a disk, a companion forms directly from the collapse of the vast cloud of gas and dust in the same manner as a star (or brown dwarf).

If the last scenario is correct, then this discovery demonstrates that planetary-mass bodies can be made through the same mechanism that builds stars. This is the likely solution because the companion is too young to have formed by the first scenario, which is very slow. The second mechanism occurs rapidly, but the disk around the central brown dwarf probably did not contain enough material to make an object with a mass of 5-10 Jupiter masses.

"The most interesting implication of this result is that it shows that the process that makes binary stars extends all the way down to planetary masses. So it appears that nature is able to make planetary-mass companions through two very different mechanisms," said Kevin Luhman of the Center for Exoplanets and Habitable Worlds at Penn State University. If the mystery companion formed through cloud collapse and fragmentation, as stellar binary systems do, then it is not a planet by definition because planets build up inside disks.

The mass of the companion is estimated by comparing its brightness to the luminosities predicted by theoretical evolutionary models for objects at various masses for an age of 1 million years.

Further supporting evidence comes from the presence of a nearby binary system that contains a small red star and a brown dwarf. Luhman thinks that all four objects may have formed in the same cloud collapse, making this a quadruple system. "The configuration closely resembles quadruple star systems, suggesting that all of its components formed like stars," said Luhman.

Courtesy: Astronomy

Amazing Pic: ISS Flies Through Aurora

Written by Nancy Atkinson

What an amazing shot of the International Space Station "flying through" an aurora at orbital speeds of 28,000 kmh (17,500 mph)!

Super-space-photographer and Tweeter Soichi Noguchi captured this spectacular image earlier today, taking advantage of some rare solar activity. "Fly through Aurora at 28,000kmh. Happy 1,000 tweets" Noguichi wrote on Twitter.NOAA's Space Weather Prediction Center sent out a notice early this morning saying : "A geomagnetic storm began at 05:55 AM EST Monday, April 5, 2010. Space weather storm levels reached Strong (G3) levels on the Geomagnetic Storms Space Weather Scale."

And indeed, that solar activity created a picturesque backdrop to the ISS today! Wow!

Noguchi, a.k.a. Astro_Soichi on Twitter is setting a new standard for Twittering and Twitpics from space – and photography, too. He and his Expedition 22 crewmates recently broke the record for the amount of images taken by an ISS crew. They snapped over 100,000 images of space and Earth during their accumulated six-month Expedition, bringing the number of pictures taken from the space station to a grand total of almost 639,000 images.

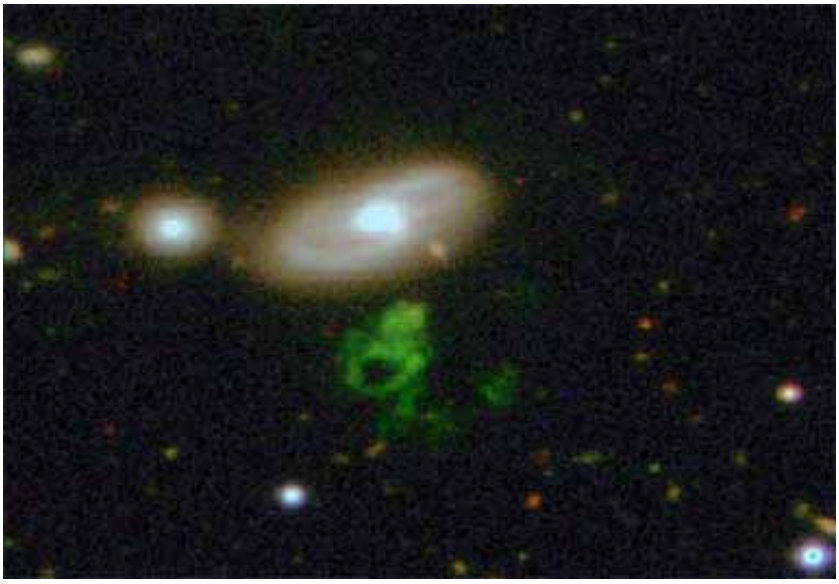
With the new crew arriving at the ISS this past weekend, Expedition 23 is now officially underway.

Check out more of Astro_Soichi's Twitter pictures on his TwitPic page.

Courtesy: Universe Today

Astronomers Begin Observing Hanny's Voorwerp with the Hubble Space Telescope

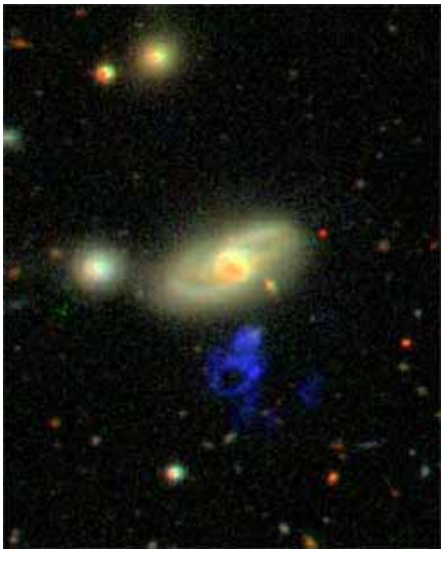
Written by Nancy Atkinson April 6th, 2010



The green "blob" is Hanny's Voorwerp. Credit: Dan Herbert, Peter Smith, Matt Jarvis,

A storybook astronomy mystery is now part of the most famous telescope in history. A team of astronomers secured time on the Hubble Space Telescope to observe Hanny's Voorwerp, the unusual object found by Dutch teacher Hanny Van Arkel while she was scanning through images for the Galaxy Zoo project.

Hubble will be trained on the Voorwerp during three separate observing sessions, the first of which occurred on April 4, 2010. "The WFC3 (Wide Field Camera 3) images were obtained (Sunday)," said Principal Investigator Bill Keel from the University of Alabama in an email to Universe Today "and I was able to pull the calibrated files over last night for a quick look. Combining pairs of offset images to reject cosmic rays optimally will take some further work, but we're happy to start working with the data and see what emerges at each step."



Hanny's Voorwerp. Credit: Matt Jarvis, William Herschel Telescope.

The Voorwerp (also known by the much less endearing name of SDSS J094103.80+344334.2) created a sensation among amateur, armchair and professional astronomers alike, almost immediately after Van Arkel saw the object in 2007 and posted a question on the Galaxy Zoo forum, asking "What is this?" All this took place just a month after the Galaxy Zoo project opened up their online citizen science shop, and the rest is history. But in case you haven't heard the story yet, a quick rundown is that 'voorwerp' means 'object' in Dutch – and as of yet, no one has determined exactly what Hanny's Voorwerp is.

The working hypothesis, according to the Galaxy Zoo team, is that Hanny's Voorwerp might be a "light echo" of an event that occurred millions of years ago. The object itself consists of dust and gas which perhaps was illuminated by a quasar outburst within the nearby galaxy IC 2497 (see the images). The outburst has faded within the last 100,000 years but the light reached the dust and gas in time for our telescopes to see the effect.

The Galaxy Zoo images come from observations done by the Sloan Digital Sky Survey. In evidence of the interest in this object, since 2007 Hanny's Voorwerp has also been imaged by the Swift gamma-ray satellite, the Suzaku X-ray telescope, the Westerbork SynthesisRadio Telescope (WSRT), the Issac Newton Telescope and the William Herschel Telescope, to name a few.

But now, the most famous telescope of all – with its new and updated instruments – will take a gander to see if the mysteries of the Voorwerp can be solved.

The team – which includes Keel, and fellow Galaxy "Zookeepers" Chris Lintott, Kevin Schawinski, Vardha Nicola Bennert, Daniel Thomas, and Hanny Van Arkel herself – submitted a proposal to the Space Telescope Science Institute back in 2008 and were among the proud and few from close to 1000 proposals submitted to be granted observing time on Hubble.

During the three observing sessions, three different Hubble instruments will be used.

"The observations use three instruments and would naturally be broken into three target visits," said Keel, "some constrained to be at different times because of the required orientations on the sky –for example, to have both Hanny's Voorwerp and IC 2497 in the narrow field of view of ACS (Advanced Camera for Surveys) with the monochromatic ramp filters."

"The next observations will probably be the most visually striking," Keel continued. "Twoorbits' worth of ACS images in narrow bands including [O III] an H-alpha emission, and are scheduled for April 12. The final visit in the program has 2 orbits of STIS (Space Telescope Imaging Spectrograph) spectroscopy around the nucleus of IC2497, and should be coming up by mid-June."

The April 4 observations included three orbits of data from the WFC3.

So, even though the first images have now been seen, the team won't be able to share their findings until all the observations have occurred and the data has been analyzed.

"I indeed can't say much more than that we got the first data in our mailboxes," Van Arkel said in an email to Universe Today. "The team is still working on it and until they've worked it out, I won't even understand enough of it myself to explain anything on the matter. It is exciting however that the investigations have started and it's nice to see how many curious people are sending me messages about it and 'retweeting' my quotes on Twitter. After almost two years, I'm very much looking forward to the outcome of all of this!"

Van Arkel isn't the only one excited.

Hanny Van Arkel. Image courtesy of Hanny.

"Through a combination of geometry and weather," Keel shared,"I saw HST sail by to our south less than two orbits after it finished this first data set. So I waved in what was probably a most unprofessional manner."

And the rest of us will be waiting – and waving – until Hubble can tell us more about Hanny's Voorwerp.

Courtesy: Universe Today

SOCIETY ROUND UP

ABERDEEN AS www.aberdeenastro.org.uk
2nd Tues at Cromwell Tower Observatory, King's College, Old Aberdeen
Email: aas@aberdeenastro.otg.uk

ABINGDON AS www.abingdonastro.org.uk
2nd Mon at Methodist Church Hall, Dorchester Crescent, Abingdon
Email: chris.c.holt@ntlworld.com

ADUR AS www.adur-astronomical.com
1st Mon at Southwick Community Centre, Southwick, Sussex
Email: robin-Durant@btconnect.com

ALTRINCHAM & DISTRICT AS
www.astroadas.org.uk
1st Fri (exc Jul & Aug) at Scout's Building on Park Road, Timperley. Altrincham
Geoff Flood 0161 980 1675
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AS OF GLASGOW
www.astronomicalsocietyofglasgow.org.uk/
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ANDOVER AS www.andoverastronomy.org.uk
3rd Thur (exc Aug) at Grateley Village Hall.
e-mail: secretary@andoverastronomy.org.uk

ASHFORD AS www.ashfordastro.org.uk
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Email: society@bedsastro.org.uk

BIRMINGHAM AS www.birmingham-astronomy.co.uk
Every Weds at Aston Uni. & Last Tues–lecture
Email: john.spittle@homecall.co.uk
Jun 29: Carl Sagan Andrew Lound

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www.blackpoolastronomy.org.uk
1st Wed of month at St Kentigern's Church Hall, Newton Drive, Blackpool
Terry Devon Tel: 01253-625975
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BOLTON AS www.boltonastro.org.uk
1st & 3rd Tues at Bolton TIC Centre on Minerva Road (nr Bolton Royal Hospital)
Peter Miskiw. Email: petermiski@hotmail.com

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Hilary on 01274 672570. johnbards@blueyonder.co.uk

BRANNEL ASTRONOMY
www.brannelastronomy.com
1st & 3rd Fri at Brannel School, St Stephens, Cornwall .
Frank Johns, 01637-878020
e-mail: frank@laplage.demon.co.uk

BRECKLAND AA www.brecklandastro.org.uk/
2nd Fri at Recreation Centre, B1077 Watton Road, Great Ellingham
Rod Crockford. Email: rod_crockford@yahoo.co.uk
May 14: 2009 Eclipse & AGM Jerry Workman
Jun 11: Galaxy Zoo Dr C Lintott
Jul 9: Images of the Universe Paul Money
Oct 8: Search fro Nova & Supernova Guy Hurst

BRIDGEND AS
www.bridgendastronomicalsociety.co.uk
2nd Fri (Sept-May) Parc Slip Nature Reserve, Aberkenfig.
Email: clivedown@btinternet.com

BRISTOL AS www.bristolastrosoc.org.uk
Every Fri at Bristol Grammar School, University Road
Simon Smith, email: secretary@bristolastrosoc.org.uk

CALLINGTON CAG www.callington-astro.org.uk
1st & 3rd Sat (exc Aug), at Space Centre, Callington Community College.
Beccy Watson; callintonastro@kimwatson99.fsnet.co.uk

CARDIFF AS www.cardiff-astronomical-society.org
Alt Thurs, Sep-Jul, at Dept Physics & Astronomy, Univ. of Wales, 5 The Parade.
David Powell, 029 2055 1704.
Email CAS@ilddat.demon.co.uk
May 13: Practical Astronomy B Sheen
May 27: How outer planets were not discovered Colin Steele
Jun 10: Is the Sun worth observing Dr S Wainwright
Jun 24: X-Files Nick Pope
Jul 8: 3 short talks

CAROLIAN AS www.carolianastro.org.uk
Contact: Chris Ashman 01562 743758.
Email: info@carolianastro.org.uk

CASTLE POINT AC www.cpac.org.uk
Every Weds at St Michaels Church, St Michaels Rd, Daws Heath, Hadleigh. 2nd & 4th Weds: Beginners/ Observing. Other Weds: talks & group events
01702 434449. Email: secretary@cpac.org.uk
May 5: The herschels of Bath Ed Goward
May 20: Messages fr0om Mercury Andrew Mowbray
Jun 16: Clusters of Galaxies Dr Carolin Crawford
Oct 6: Earth–mostly harmless Andrew Mowbray

CHESTER AS www.cpac.org.uk
Last Weds (no meeting Aug & Dec) at Burley Memorial Hall, Waverton, Chester
Tim Colegate-. Email: tjcsmith@btinternet.com

CHIPPING NORTON AAG www.cnaag.com/
3rd Mon Robin Smitten 07900-858690.
Email: robin@chippingnortontheatre.com

CLACTON AS www.clactonastronomy.co.uk
1st Thurs (exc Aug) at Quakers House, Granvile Road, Clacton-on-Sea. CO15 6BX
David Pugh 01255 429849 e-mail pugh-d@sky.com
May 6: New Adventures in Imaging Nik Szymanek
Sep 2: Eclipses of 2008 & 9 Jerry Workman
Nov 4: Probing Cosmic Dark Ages with GRB Prof Nial Tanvir

CLEETHORPES AS
www.cleethorpesastronomy.co.uk
Meetings held at the Beacon Hill Observatory, Cleethorpes, start at 7.30pm.
Mike Brightmore. Tel: 01472-509880
e-mail Michael.brightmore@ntlworld.com

CLYDESDALE AS www.clydesdaleastro.org.uk
2nd Mon at Dunglass House, Ayr Road, ML11 9TU
Contact: Lyn Smith 07725 347711. e-mail: clydesdaleastro@hotmail.co.uk

CORNWALL AS www.CornwallAS.org.uk
2nd Tues & 4th Thurs at WI Hall, Mabe, Penryn..
Robert Beeman (01326-341164)
Email: info@CornwallAS.org.uk

COTSWOLD AS www.cotswoldas.org.uk
2nd Sat at Millenium Hall, Bishop Road, Shurdington, Cheltenham.
Callum Potter (01684-773256)

COVENTRY & WARWICK AS http://uk.geocities.com/covwaras/
2nd Fri at Earlsdon Methodist Church Hall, Earlsdon Ave South, Earlsdon
email: cov_wark_as@yahoo.co.uk

CRANBROOK & DISTRICT AS www.cadas.com/
2nd Mondays at Cranbrook School Observatory.

CRAWLEY AS http://uk.geocities.com/crawleyas/
3rd Fri (exc July & Aug) at Ifield Community Centre. 7.30 pm.
Jim Swift 01293-882560
E-mail: cytron@btinternet.com

CROYDON AS www.croydonastro.org.uk
2nd Fri during term time at Royal Russell School, Coombe Lane
Paul Harper email: chairman07@croydonastro.org.uk

DALGETY BAY AC http://db-astro.org
Meets at The Kabin, junct Moray Way South & Regents Way.

DERBY & DISTRICT AS www.derbyastronomy.org
1st Fri (exc July) at 7.30 at Friends Meeting House, St Helen's St, Derby

DONCASTER AS www.donastro.org.uk
2nd & 4th Thurs at Church House–behind St George Minster, Doncaster.
Mrs Lesley Hardware on 01302-743352
email: secretary@donastro.org.uk

DUMFRIES AS Society web-site www.astronomers.ukscientist.com
Monthly meetings at the St. George's Churchhall, George Street, Dumfries
Email: lesley.burrell@btinternet.com or 01387 269762

EASTBOURNE AS www.EastbourneAS.org.uk
Saturdays at the Willingdon Memorial Hall, Church Street, Willingdon p.m.
Bob Cripps, tel. 01323 732067
email bobwcripps@btinternet.com

EAST RIDING ASTRONOMERS
www.eastridingastronomers.org.uk
3rd Mon at the Friends Meeting House, Quaker Lane, Beverley.
Tony Scaife, email astrogen@astrogen.karoo.co.uk

EAST SUSSEX AS www.esas.org.uk
1st Thurs. St Mary's School, Wrestwood Road, Bexhill-on-Sea. TN40 2LU
Andy Lawes Tel. 01424 819450
email andy@esas.org.uk
6 May: Space in next 50 yrs Dr D Whitehouse

FALKIRK ASTRONOMERS www.astronomy-falkirk.co.uk
2nd Weds (exc June/July) at Old Peoples Welfare Hall, Laurieston, Falkirk.
email: malcolm@astronomy-falkirk.co.uk

FARNHAM AS www.farnham-as.co.uk
Meet 2nd Tues at Willis Hall, Sandy Lane, Church Cookham, Fleet
Barry Bellinger, tel. 07748766610
barry.bellinger@nokia.com

FLAMSTEED AS www.flamsteed.info
1st Mon at Royal Observatory & National Maritime Museum, Greenwich.
Friends Office. tel. 020 8312 6678
E-mail: jjbendall@btinternet.com

FURNESS & SOUTH LAKELAND AS
www.furness-astrosociety.org.uk
1st Fri (exc Jul/Aug) at Trinity Church Centre, Warwick St. Barrow-in-Furness
Richard Alldridge, 01229 826864
Email: Richard@alldridge.worldonline.co.uk

GUERNSEY AS www.astronomy.org.gg
Every Tues at the Observatory, Rue Lorier, St. Peters, Guernsey.
Debby Quertier. 01481 725760
Email: quertiers@thomasmiller.com

GUILDFORD AS www.guildfordas.org
1st Thurs at Guildford Institute, Ward Street, Guildford
John Axtell. 01932 341036 johnaxtell42@aol.com
Jun 3: The Square Km Array Prof A Brown
May 6: May the Force be With You Dr P Daniels

HAMPSTEAD GARDEN SUBURB AS
Last Wed at Free Church Hall, Northway, NW11.
Dianne Fishman 020 8458 4038
email: hgsas@dfish.demon.co.uk

HAMPSHIRE ASTRONOMICAL GROUP
www.hantsastro.org.uk
Wed & Fri at Observatory, Hinton Manor Lane, Clanfield. Main monthly lecture 2nd Fri (exc Aug) Clanfield Memorial Hall, South Road, Clanfield
Graham Bryant 02392 241764
email: graham.bryant@hantsastro.org.uk
or graham.g.bryant@btinternet.com

HANTS ASTRO www.hantsastro.org
David Woods 023 9261 7092
email: subscribe@hantsastro.org

HARROGATE AS
Last Fri at The Green Hut, Harlow Community Centre, Harlow Ave.
Email: patsyorio@tiscali.co.uk

HAVERING AS http://homepages.tesco.net/~nik.szymanek/havering.htm
3rd Wed at Cranham Community Centre, Marlborough Gardens, Cranham. Contact: Frances Ridgley 01708 227397

HEART OF ENGLAND AS www.hoeas.co.uk
Last Thurs Furnace End Meeting Site, The Old Exchange, Shustoke, Warwickshire
email: hoeas@tiscali.co.uk

HEBDEN BRIDGE AS
Meetings at Hope Baptist Church Rooms at approx 4 week intervals.
Len Entwhistle (01422-378368) or visit FAS webpage.

HEREFORD AS
Meet 1st Thurs at Kindle Centre, Hereford .
Contact: Paul Olver (01432-761693)
email: info@hsastro.org.uk.

HERTFORD AS http://hag.110mb.com/hag/
Meet Cricket Pavilion, Hertingfordbury
Contact: Marion email: secretary@hertsastro.org.uk.

HERSCHEL AS www.herschel-astrosoc.co.uk
Email: hasadmin@gmail.com

HIGHLANDS AS www.spacegazer.com
1st Tues at The Green House, Beechwood Business Park North, Inverness.
Eric Walker, Tel: 01349 863821
email: pat.williams@ndirect.co.uk

HORSHAM AS www.horshamastronomy.co.uk
1st Wed at Christs Hospital School, Horsham, West Sussex.
Richard Griffith
email: secretary@horshamastronomy.co.uk

HUDDERSFIELD A & P SOCIETY
www,huddersfieldastronomy.org.uk
Every Fri at 4A Railway Street.
Email: marcus.armitage@ntworld.com

HULL & EAST RIDING AS www.heras.org.uk
2nd Mon at Room S25, Wilberforce Bldg, Uni of Hull, Cottingham Road, Hull
Mark Evans, Secretary.
E-mail: mark.Heras@merrydowncontrolware.co.uk

ILKESTON & DISTRICT AS
2nd Tuesdays at Hayloft Erewash Museum, Ilkeston, Derbyshire
Mary McMulty, tel. 01298 78234
email: mintaca@msn.com

IRISH AA www.irishastro.org
Meets at Bell Lecture Theatre, Physics Building, Queen's Uni, Belfast
e-mail: iaa@irishastro.org

ISLE OF MAN AS www.iomastronomy.org
1st Thurs at the IOM Observatory, Foxdale.
James Martin e-mail: ballaterson@manx.net

JAVEA & DISTRICT AS www.U3ADenia.org
Meets 1st Mon at 3pm at Hotel La Racona, Denia, Costa Blanca
Email: edmo734g@midasdsl.com

JERSEY AC www.jerseyastronomyclub.org.je
Meets 2nd Mon at Sir Patrick Moore Astronomy Centre, Les Creux, St Brelade.
Anthony Isherwood. 01534-744510
e-mail: kannyfixit@jerseymail.co.uk

KIELDER OBSERVATORY AS
www.kielderobservatory.org
Lyn Henderson. Tel: 0191-4261708
e-mail: lynhenderson@blueyonder.co.uk

KNOWLE AS www.knowleastro.org.uk
1st Mon (+/- 1 wk for BH exc Aug) at St George & St Theresa's Parish Centre, Dorridge, Solihull.
Nigel Foster. 21 Speedwell Dr, Balsall Common, Coventry CV7_7AU Tel: 01676-535941

Apr 26:	Special Relativity	Dr Lucie Green
Jun 7:	Atmosphere of Planets	Dr B Lambourne
Jul 5:	AGM	

LEEDS AS www.leedsastronomy.org.uk
2nd & 4th Wed at The Friends Meeting House, Carlton Hill, 188 Woodhouse Lane, Leeds LS2 9DX–19.30
Mailto: xavier@leedsastronomy.org.uk or xvermeren@gmail.com

LEICESTER AS www.leicester-astronomical.co.uk
Meets 2nd and 4th Tues 19:30. National Space Centre, Exploration Drive, Leicester
Chris Gutteridge 0116 270 0596
email: chris@gutteridge.co.uk

LETCHWORTH & DISTRICT AS
Meets last Wednesday of the month at Plinston Hall, Letchworth: 7:45pm
Nick Ellis e.mail: ellis.nick@virgin.net

LINCOLN AS www.lincolnastronomy.org/
1st Tues (exc Jan) at 23 Westcliffe St, Lincoln
David Swaby. Tel: 01522-531591

LIVERPOOL AS www.liverpoolas.org
3rd Fri at The Quaker Meeting House, 22 School Lane, Liverpool L1 3BT
email: ggastro@liverpool.ac.uk

LOUGHTON AS www.las-astro.org.uk
Every Thurs in the Scout Hall, Loughton Lane, Theydon Bois, Essex.
Jerry Workman (0208-507-7568)

LOWESTOFT & GT YARMOUTH RA (LYRA)
2nd Tues at Waveney Gymnastics Centre (access Notley Rd).
Richard Chilvers: 01502 57401
email: good.goat@tiscali.co.uk

LUTON AS www.lutonastrosoc.org.uk
Last Thurs at Putteridge Bury Campus, University of Bedfordshire
Geoff Mitchell. Email: user998491@aol.com

MACCLESFIELD AS www.maccastro.com
1st Tues (exc Jan) at Jodrell Bank Observatory &3rd Tues at Goostrey Village Hall.
email: secretary@maccastro.com

15 Jun:	Exoplanets	Dr Frazer Pearce

MAIDENHEAD AS www.maidenhead-astro.net
1st Fri (exc July & Aug) at Stubbings Church hall, Maidenhead SL6 6QZ
Tim Haymes 07796-164010

MANCHESTER AS www.manastro.co.uk/
Open every Thurs - Godlee Observatory, Sackville Building, University of Manchester,
Email: massecretary@manastro.co.uk

MANSFIELD & SUTTON AS www.sherwood-observatory.org.uk/
Sherwood Observatory, Coxmoor Rd, Sutton-in-Ashfield. NG17 5LF
Cathy Beaumont 01623 552276
Email: secretary@sherwood-observatory.org.uk/

MARCHES A G www.spaceguarduk.com/mag
2nd Fri at Spaceguard Centre, Knighton, Powys. LD7 1LW.
Michael Birch 01597 850010 zakdorn@hotmail.com

MEBOROUGH & SWINTON AS
www.msas.org.uk
Every Thurs at Swinton Working Mens Club, 4 Station Rd, Swinton. S64 8AU
Shaun O'dell (Secretary) 01709-579529

MID KENT AS www.mkas-site.co.uk/
2nd and last Fri at The Bredhurst Village Hall, Hurstwood Road, Bredhurst, Kent
email pwparish54@yahoo.co.uk

MIDLANDS SPACEFLIGHT SOC
www.midspace.org.uk

MILTON KEYNES AS www.mkas.org.uk
Alt Fri at Rectory Cottages, Church Green Road, Bletchley, Milton Keynes
Mike Leggett Tel: 01908 503692
Email: publicity@mkas.org.uk

14 May:	Viking Astronomy	Martin Lunn
11 Jun:	Charles Messier	Pierre Girard
9 Jul:	Astronomers in Obscurity	Mark Hurn

MORAY AC, SIGMA www.sigma-astro.co.uk
1st Fri at Birnie Village Hall, Thomshill, Elgin, Moray.
Ian Brantingham 01466 771371
Email: ian@branters.freeserve.co.uk

NENE VALLEY AS
www.eastnothantsastronomy.org.uk
1st & 3rd Mon at Chelveston Village Hall at 7.45pm.
email: stevemwilliams@fsmail.net Tel: 01933-650331

May 3:	Short talks	
May 10:	Universe Discovered	

NEWBURY AS www.newburyas.org.uk
1st Fri (Sept-June) United Reformed Church Hall, Cromwell Place, Newbury.
email: rfleet@clara.co.uk

NORMAN LOCKYER OBS SOC http://www.ex.ac.uk/nlo/welcome.htm
Fris & 2nd Mon at Norman Lockyer Obs, Sidmouth Devon. EX10 0YQ
e-mail: enquiries@normanlockyer.org
Tel: 01395 512096

NORTH ESSEX AS http://www.neas.me.uk
3rd Thurs (exc Aug & Dec) at Henry Dixon Hall, Rivenhall End, Witham.
Neil Short e-mail: njs.int@btinternet.com

NORTH NORFOLK AS http://www.nnas.org
At General Townend Club (Royal British Legion), Cattle Market St, Fakenham.
Email: japrockter@aol.com

NORTH STAFFS AS www.northstaffas.co.uk
1st Tues at 21st Harsthill Scout Group HQ, Mount Pleasant, Newcastle-under-Lyme
Duncan Richardson 07752042688
e-mail: secretary@northstaffas.co.uk

NORTH WALES & LLANDRILLO COLLEGE AS
www.manastro.co.uk/nwgas/llandrillo
2nd Tues at Lecture Hall, Llandrillo College
Jean Smith e.mail: jsmith2859@aol.com

NORTHANTS AA www.naastronomy.com
1st Tues at Church House, St Bodolphs Rd, Barton, Seagrave, Kettering and on 3rd Tues at Newton Field Centre nr Geddington.
Jane Mill. 07753 501280
email: janeqmills@yahoo.co.uk

NORWICH AA
www.norwich.astronomicalsociety.org.uk/
3rd Fri at The Seething Observatory, Toad Lane, Thwaite St Mary
David Balcombe 01953 602624.
email: nassec@tiscali.co.uk

NOTTINGHAM AS www.nottinghamastro.org.uk
1st Thurs British Geological Survey, Nicker Hill, Keyworth, Notts. NG12 5GG.
Sam Boote. email: nottinghamastro@yahoo.co.uk

OBSERVATORY FOR CORNWALL
www.observatoryforcornwall.co.uk
email incoming@observatoryforcornwall.co.uk

ORPINGTON AS www.orpington-astronomy.org.uk/
4th Thurs at High Elms Nature Centre.
email membership@orpington-astronomy.org.uk

ORWELL AS www.oasi.org.uk/
Weds at Orwell Park Observatory, Nacton, Ipswich IP10 0ER
Roy Gooding (Secretary) 01473-462977
email ipswich@ast.cam.ac.uk

PAPWORTH ASTRONOMY CLUB
1st Wed at Vinter Room, Vinter Close (off Elm Way), Papworth Everard
Peter Sandford 01480 830729
email peter@cheere.demon.co.uk

5 May:	Secrets of the Universe	Paul Murdin

PETERBOROUGH AS www.pas-stargazer.co.uk
1st Tues at St Kingburgh Church Hall, Castor, Peterborough.
Gerry Holland 01733 769639
Email: gerry_comrep@yahoo.com

PLYMOUTH AS
2nf Friday at GK Centre, Alfred Street (off Lockyer St), Plymouth
Alan Penman (Chair) 01752-338491
email: oakmount12@aol.com -

PORT TALBOT AS
1st Tues–7.45pm at Mozart Drive Community Centre, Sandfields, Port Talbot.
John Minopoli (secretary) - phone 01792 850919.
email: john@jminopoli.freeserve.co uk

READING AS www.readingastro.org.uk
Meets third Sat 7.00pm at St Peters Church Hall, Church Road, Earley.
Chris Menmuir email: info@readingastro.org.uk

REDDITCH AS www.redditch-astro.org.uk
1st Mon (exc Aug) at St Augustine's Catholic High School, Stonepits Lane, Hunt End, Redditch B97 5LX.
email: membership@redditch-astro.org.uk

RENFREWSHIRE AS
www.renfrewshireastro.co.uk
Meets every Fri 7.30pm at The Coats Observatory
Ian Anderson Tel: 0141 580 9852
email: ianander2000@yahoo.co.uk

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SALFORD AS www.salfordastro.org.uk
1st Wed at The Observatory, Chaseley Road, Salford: John Pond

SALISBURY AS
1st Thurs of month at Glebe Hall, Winterbourne Earls, Salisbury–3rd Thurs Viewing night (if clear)
Rita Collins: 01722-332892
Email: astrocat1@talktalk.net

SAWTRY & DISTRICY AS
Last Fri (exc Jul/Aug) at the Football Pavillion, Greenfields, Sawtry.
Contact: Pan Dow 01733-242227
Email: pameladow@btinternet.com

SCARBOROUGH & RYDALE AS
www.scarborough-as.org.uk
3rd Fri (exc Aug & Dec) at East Ayton Village Hall, Willson Lane, East Ayton
01723 500389
email: gwenfrangwernan@btinternet.com

SEKAS (SOUTH EAST KENT) www.sekas.co.uk
Tony Bennet 01843-831079
email: Secretary@sekas.co.uk

SHEFFILED AS www.sheffield.org.uk
Tony Bennet 01843-831079
email: info@sheffield.org.uk
Jun 21: Missions to Mars
Jul 7: Search for Life in Space Dr D Whitehouse

SHETLAND AS
Monthly, South Mainland, Shetland
Peter Kelly Tel: 01957 733242
Email: theglebe@zetnet.co.uk

SHROPSHIRE AS www.shropshire-astro.com
1st Sat at Rodington Village Hall
Contact: Mark Wiggin.
e-mail: mark.wiggin@blueyonder.co.uk

SOLENT AMATEUR ASTRONOMERS
www.delscope.demon.co.uk
3rd Tues. Room 8, Oaklands Centre, Fairisle Road, Lordshill, Southampton
Ken Medway. 02380-582204
email: ken@medway1875.freeserve.co.uk

SOUTHAMPTON AS www.southampton-astronomical-society.org.uk
2nd Thurs at Edmund Kell Unitarian Church Hall, Bellevue Road
Email: secretary@southampton-astronomical-society.org.uk

SOUTH CHESHIRE AS www.scastro.org/
scastro.stewart@googlemail.com
Meets alternate Thurs

SOUTH LINCS A & G S www.solags.co.uk
3rd Frid (exc Jul/Aug) at St Mary's Church Hall, Pinchbeck, Spalding.
Martin Anderson 01406-380003
email: secretary@solags.co.uk
Jun 18: Hometown Jeff Powell

SOUTH WEST HERTS AS www.swhas.org.uk
Shirley@atwhitelands.freeserve.co.uk

STAFFORD & DISTRICT AS www.freewebs.com/philiphall/
3rd Thurs at Weston Road High School, Stafford. ST18 0YG
Joe Jaworski, 0543 686043

ST NEOTS AS
Meets 1st Mon 19.00hrs at Paxton Pits Nature Reserve, High St., Little Paxton, St Neots.
David Roberts 01480-212960
email: davidr.astro@btinternet.com

STOUR AS www.stourastro.org.uk/
Meets 1st Tues 19.30hrs in the Jubilee Room, Cavendish Memorial Hall,
Tony Dagnall email: members@stourastro.org.uk

STRATFORD UPON AVON AS www.astro.org.uk
Home Guard Club, Tiddington, Stratford upon Avon.
Mike Whitecross 01789 731784

SUNDERLAND AS www.sunderlandastro.com
2nd & 3rd Sunday Wildfowl & Wetlands Trust, Washington
Graham Darke 0191 415 2625 darke@bun.com

SWANSEA AS www.swanastro.co.uk
2nd & 4th Thur at Lecture Theatre C, Science Block, Uni of Wales, Swansea 01792-299311

TAVISTOCK AS
http://tavistockastronomicalsociety.googlepages.com/home
Kelly College. Exeter Road, Tavistock
Email: jewelsv137@aol.com Tel: 07828-731444 or robin@sigmanova.com

THE LEWES ASTRONOMERS
www.lewesastro.org.uk
1st Wed at Southover Grange, Southover High St. Lewes. BN7 1TP.
Alice Smol 01273-477441 email: alice.smol@tesco.net

THURROCK AS
www.thurrockastronomysociety.com
First Wed (exc Aug) at Methodist Hall, High Street, Horndon -on-the-Hill SS17 8LN
Roy Hookway Tele;01375 676602
email: roy.hookway1@btinternet.com

TIVERTON AS ww.tivas.org.uk
Fri at St Aubyn's School, Blundells Road, Tiverton.
Neil Purves 01884-277425

TORBAY AS www.torbayastro.org
1st & 3rd Thurs - Sep to Apr at Torquay Boys Grammar School.
Dennis Humphreys on 01626 367280

UNIVERSITY OF BIRMINGHAM AS
www.astrosoc.org.uk
We are a University society but all are welcome.
email: astrosoc@astrosoc.org.uk

USK AS www.uskastronomicalsociety.org.uk
Email: jbprince9@yahoo.co.uk

VECTIS AS (IoW) www.vectis-astro.org.uk
4th Fri of month (exc Dec) at Parish Hall, Town Lane, Newport.
Sue Curd email: secretary@vectis-astro.org

WADHURST AS www.wadhurst.org.uk/was/
Third Wed at the Methodist Church Upper Room, High Street, Wadhurst.
G G Rathbone, 13 Brookfield, Kemsing, Sevenoaks, Kent. TN15 6SQ

WALSALL AS www.walsallastro.co.uk
Every Thurs at the Rushall Olympic Football Club, Dales Lane, Walsall.
Alan Ledbury 01922 632624 email:
email: g.ledbury@blueyonder.co.uk

WEBB DEEP-SKY SOCIETY
www.webbdeepsky.com/
Bob Argyle. email: rwa@ast.cam.ac.uk

WESSEX AS www.wessex-astro-society.freeserve.co.uk
First Tues - Allendale Centre, Wimborne, Dorset.
Alan Jefferis, e-mail alan@ajefferis.freeserve.co.uk

WEST DIDSBURY AS
2nd Mon (exc Aug) at William Hulme Grammar School, Springbridge Rd, Whalley Range. M16 8PR
Susie Metcalfe email: susiemetcalfe@yahoo.com

WEST OF LONDON AS www.wolas.org.uk
Second Mon (exc Aug) at: Christ Church Chapel, Redford Way, Uxbridge AND at St John's Ambulance Hall, North Harrow (odd months)
Duncan J Radbourne.
Email: duncan.radbourne@gmail.com
May 10: Harriot to Hubble Prof Allan Chapman

WEST NORFOLK AS
http://westnorfolkas.googlepages.com/wnashomepage
Meets on 2nd Mondays at Tottenhall Village Hall, Nr Kings Lynn
Derek Crawford Email: 163@hotmail.com
23 Beaumont Way, Marlborough Pak, King's Lynn. Norfolk. PE30 4UB

WEST YORKSHIRE AS www.wyas.org.uk
Every Tues (exc Aug/BH's) at 'Rosse Observatory', Carleton Rd, Carleton, Pontefract.
James Boulton 01924-379376.
Email: secretary@wyas.org.uk

WILTSHIRE AS www.wasnet.co.uk/
Andrew Burns Email: anglesburns@hotmail.com

WIGTOWNSHIRE AS www.wigtownshire-astro.org.uk
Second Wed Glenamour, Newton Stewart.
Robin Bellerby 01671-404387 / 07966-413679
Email: robin@glenamour.com

WHITE PEAK ASTRO OBS GROUP
www.wpaog.co.uk/
Hopton Cottage, Hopton, Top Hopton, Derbyshire, DE4 4DF
Robin Spencer. Tel: 01332-881912
Email: robin108@tiscali.co.uk

WOLVERHAMPTON AS www.wolvas.org.uk
Alt Mon, between Sep & Apr at The Environmental Centre, Highfields School, Boundary Way, Penn Wolverhampton. WV4 4NT
Graham Mogford grahammogford@hotmail.com

WORCESTER AS www.worcesteras.freeserve.co.uk
Meetings held 2nd Thurs 8-10pm at University College, Oldbury Rd, Worcester
Michael Morris. Email: michaelmorris@hotmail.com

WORTHING AS
Meet 3rd Mon (exc Aug) 7.30pm at Emmanuel United Reform Church, corner Heene Rd/St Michaels Rd.
Graham Boots
Email: g.boots@sky.com 01903 505346
101 Ardingly Drive, Goring, Worthing West Sussex BN12 4TW

WORTHING ASTRONOMERS
www.worthingastronomers.org.uk
Meet 1st Wed at 'North Star', Littlehampton Rd., Worthing
Brian Halls: 01903-521205
Email: info@worthingastronomers.org.uk

WYCOMBE AS www.wycombeastro.org.uk
Third Weds at Woodrow High House, between High Wycombe and Amersham.
Jackie Harris. Email: www.wycombeastro.org.uk
Jun 16: Distance Prof Stuart Malin
Jul 21: Life & Science of Galileo Graham Marett

YORK AS www.yorkastro.co.uk
Denham Room, The Priory Street Centre, York,
Martin Whillock on 01347 821849
email: martin@whillock.me.uk

LIST OF OFFICERS 2008/2009

President, Secretary, Treasurer & Newsletter Editor - See Page 1

Vice President:
Callum Potter: vicepresident@fedastro.org.uk

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Meetings Sec:
Shaun O'Dell (see details on Page 1)

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Chilterns Group :	Steve Williams
North West Group :	vacant
West Midlands :	Dave Evetts
SAGAS:	Keith Brackenborough
Yorkshire Group :	Paul Harper

Details of meetings mentioned in the Society Roundup should be confirmed before travelling. All programmes may be subject to change with no notice. The FAS can accept no responsibility for any inaccuracies. However if the details of your society are incorrect, or indeed if you aren't included, please send details to the Editor.

Deadlines for submission for the next newsletter:
Summer 2010 — 20 July 2010
Please remember to send ALL items to the Editor. Material can only be returned if supplied with a SAE.