FAS Newsletter

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

ANOTHER SUCCESSFUL FAS CONVENTION

Held on Saturday 9th October, at the Institute of Astronomy in Cambridge, the Annual FAS Convention proved to be a great success. The visitors were presented with an interesting and varied range of talks as well as trade stands at which to part with cash in exchange for the latest item of equipment.

After FAS President had welcomed the delegates, Jerry Stone got the proceedings underway with his talk entitled *'Visiting the Lord of the Rings'.* Jerry covered the history of discoveries related to the planet Saturn and then went through a blow-by-blow account of the mission of Cassini-Huygens. Whilst most of the delegates were probably generally aware of this mission, this talk tied the whole matter together very well and most listeners learned something new on the subject.

Professor Phillipa Browning *(University of Manchester)* was next on after the coffee break with her talk on *'Our Active Sun'.* After giving a brief but technical description of our local star, Phillipa explained the results being obtained by the later means of examining the Sun such as Solar Dynamic Observatory (SDO) and recent data from SoHO. The solar cycle was outlined and the current cycle–23, was discussed. In fact Cycle 23 has lasted over 12 years and is the longest for over a century.

The first on after the lunch break was Dr. Steve Owens who gave an interesting review of IYA 2009. The breadth of activities organised by many, many societies showed how active amateur astronomy is in the UK.

It was opportune (!!) that Steve was here to give this review because it had been decided that his efforts on IYA 2009 deserved him being the receiver of this year's Eric Zucker award. The presentation was made by the 2009 winner, Jerry Workman.

Steve had also been awarded the Joy Griffiths Award by the BAA Campaign for Dark Skies and so Bob Mizon used the FAS Convention as the place to present this award. It was for Steve's efforts towards the achievement of the UK's first dark sky reserve at Galloway Forest Park.

The FAS AGM was then held, business being transacted without controversy.

Professor Tim Naylor *(Exeter University)* then presented his talk *'Star Formation'.* He discussed his work on star formation, which he said could be termed 'stellar archaeology'. The structure of galaxies and their distribution was outlined. The latest theories on star formation from collapsing areas of gas were discussed and several spectacular simulations of galaxy formation and collision were shown. Tim also discussed star types and gave the best explanation of the Herzsprung-Russell diagram many have seen.

After the tea break and the raffle draw, the final speaker of the event was Dr Peter Wheatley *(University of Warwick)* who gave a talk entitled *'Hunting for Extra-Solar Planets using Small Telescopes'.* For some this title may have been a little misleading in that they had hope of going home and find extra-solar planets with their 150mm Newtonian! Peter outlined the work he was doing as a founder member of the Wide Angle Search for Planets project (WASP). The problems of finding these bodies were explained as were the methods currently being developed to overcome these difficulties.

Once again a great programme had been put together–Steve Williams must take the full credit. However, a word must be said for the real star of the convention!! - Brian Lister of Cambridge AS.

Jack Martin explaining the intricacies of recording and analysing spectra

For those of you who do not know Brian, he was the one who worked tirelessly at providing the tea and coffee–and with a smile!! The biscuits probably kept a number going through the day, bearing in mind the lack of catering at this event.

See you all at FAS Convention 2011–date and venue to be announced in due course.

More photos of the event are to be found on Pages 2 and 9.

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Presidents Spot

I'd like to begin by thanking all those who attended the FAS's Convention and AGM at the beginning of October. The event was a great success with getting on for 160 attendees. The talks were very good, there were loads of trade stands and nothing went wrong! A great astronomy day out and all for just £5 with a free Astrocalendar and tea, coffee and biscuits thrown in. At the AGM we agreed to keep the subs level at the same level as last year and with a 50% discount for prompt payment. So when the subs renewal notice is received by your society next January please make sure your Treasurer pays them promptly!

In a previous newsletter I stated that we were going to post details on the FAS website of what the FAS Council posts and duties are so that you will have a better idea of what Council members do. That has been done and I encourage you to take a look at the information:

(http://fedastro.org.uk/fas/index.php?option=com_content&task=view&id=96&Itemid=88).

I am hoping that when an appeal for volunteers to serve on the Council is issued next year, you will use this information to consider whether you can put yourself forward for a spell on Council.

Also on the FAS website you will find a map showing the location of member societies of the FAS. Clicking on the location markers gives information about the society concerned. However if your society is not on the map it's because your society's FAS contacts have not provided the information (using the on-line upload) for us to include.

Not for the first time, we recently discussed in the FAS Council the question of dropping the printed newsletter and simply continue with the electronic PDF version e-mailed to society contacts. The economic advantages of such a change are undeniable but we simply do not believe that sufficient societies will establish and reliably maintain the e-mail distribution of the newsletter to their members. Whereas it involves little work for society contacts to take the printed newsletters along to their meetings for members to simply pick up and read.

The newsletter is a direct channel of communication from the FAS Council to the members of the FAS member societies which we regard as very important indeed and will not risk that link being broken. Hence we will continue with the printed newsletter and at the same time encourage people to ask their society's FAS contacts to send them the electronic version of the newsletter which has expanded contents. If you haven't seen the e-version yet there are back copies downloadable from the FAS website.

Best wishes and clear skies,

Richard Sargent
president@fedastro.org.uk

Images from the FAS Convention 2010
Top left: Brian Lister dispensing succour to the hordes!!
Top right: Jerry Workman presenting Steve Owen with the Eric Zucker Award
Bottom left: Delegates during a break in proceedings
Bottom right: Gary Gawthrope and John Axtell parting arriving delegates from their money.

Dark Sky Map Building

Frank Johns

I read Steve's letter with interest, because, with his enthusiasm for astronomy as shown by his efforts in promoting 2009 The Year of Astronomy, if he was recommending 'mydarksky', then there must be something to it.

As you will se when you log onto MyDarkSky, it contains a series of maps of the United Kingdom which will, when populated with data, show the limiting magnitude of the night sky. There are three maps (SQM, NELM & ORION) which will show the magnitudes each as measured by a different method. However at this time none of these maps yet has significant data spread.

The SQM map is based around quantitive measurements taken using the Sky Quality Meter. This instrument measures the sky brightness in magnitudes per square arcsecond.

At about £80 each, the SQM is probably more than the average amateur astronomer would wish to fork out, bearing in mind the demands made on the wallet by more 'pressing' items of kit. However it is more likely to appeal to astro-societies, where the cost can be shared between a number of astronomers and where a local 'map' can be put together before being uploaded to MyDarkSky.

The other two maps, NELM and ORION, are based on qualitive measurements. NELM using the stars in Ursa Minor and ORION counts that stars that can be seen in the constellation Orion. These have the attraction that they cost nothing other than time.

Whilst MELM can be undertaken at any time of year, ORION on the other hand can only be used during only part of the year.

There are, of course, other areas of the sky that can be used for assessing limiting magnitude and all use the same approach—i.e. counting the number of stars that the observer can distinguish in a set area of sky.

A particularly useful resource can be found on the website of the International Meteor Organisation.

www.imo.net/visual/observation.lm

The following extract from the IMO site is particularly helpful:

The darker and more transparent the sky and the more sensitive your eyes, the more meteors you can see. To use your observations for scientific analyses a quantitative characterization of these factors has to be established. The limiting magnitude (which is defined as being the magnitude of the faintest star near the zenith that the observer can detect using the slightly averted naked eye) defines both the condition of the sky's clarity and the quality of the observer's eyes. Please note, the limiting magnitude is an observer specific quantity. Do not be surprised if other observers at the same site obtain different limiting magnitudes to you. This is the rule, rather than the exception. Only record your own values! There are several methods for determining the limiting magnitude. We describe one which is favoured by many meteor observers.

IMO lists 30 sections of the sky, each area delineated by 3 or 4 named corner stars. The observer then counts the number of stars he/she can see in this area, including the named stars. For each area there is a chart where the numbers of stars counted will show the Limiting Magnitude at that time.

Of course, even in areas of the darkest skies, the LM will not be a constant. Atmospheric moisture and many other factors will affect it, and the greater the pollution, light or atmospheric, the greater will be the variability.

For MyDarkSky to be a useful tool, it will be necessary for astronomers all over the UK to take measurements and enter them into the MyDarkSky map.

The results would benefit us all—so get to it!!

LETTERS

Dear Amateur Astronomy Society Members,

I have recently become aware of an excellent new resource created by Malc Beesley and Darren Roberts,

http://www.mydarksky.com

This website aims to become the main location of all dark sky data, whether from Sky Quality Meter (SQM) readings, or from Naked Eye Limiting Magnitudes (NELM).

If you or any other members of your amateur astronomy society have gathered SQM or NELM data for your local area you can add it to the database at mydarksky.com, allowing us to build an overview of on-the-ground readings, something that will be invaluable for dark sky efforts in the UK.

I hope you can support this project, and Malc would be happy to answer any questions you might have about it.

Many Regards

Steve Owens
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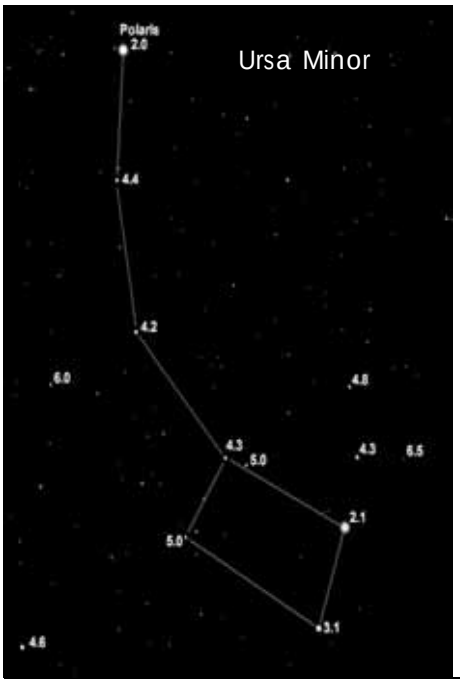
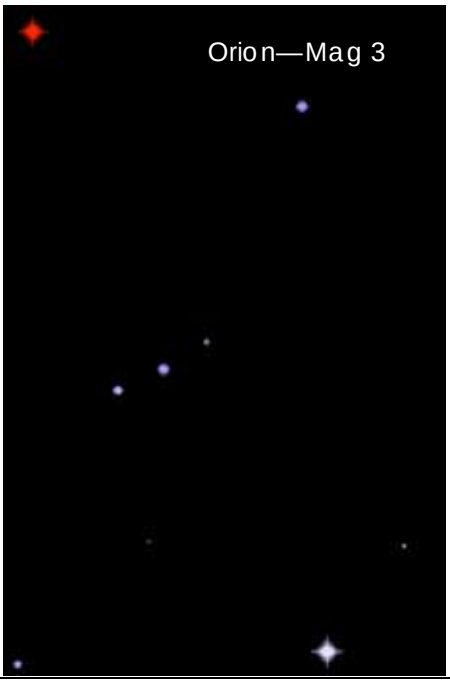
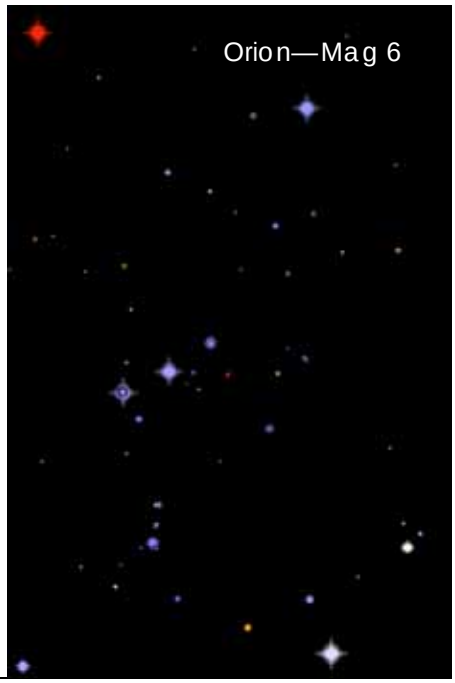






Stargazers—The Next Generation

Shropshire AS at Work

Steve Szwajkun reports:

They arrived by bus and coach even the walking bus made a scheduled stop! "What's this silver inflatable tent-like object shimmering in the school hall?" "What's that grey ball for?" "Cor, that's a big one." "The tea and coffee is in here."

These were just some of the comments as we were greeted by staff at the Wellington Road school and shown a classroom where we could display our boxes of 'stuff '.

Gary Thompson, Deputy Headteacher at Newport Girls High School, had organised what was promoted as a 'space day for Newport's gifted and talented youngsters'. He had enlisted the services of Keele University who arrived with a mobile planetarium and a small team armed with boxes of balls which were to be used to make model molecules. The supporting act was two members of the SAS in the form of Douglas Renton-Cooper and Steve Szwajkun.

After half an hour setting-up time, we were able to slump in a couple of chairs with a cup of tea awaiting the arrival of our first conscripts. The idea was that as the youngsters moved between the two organised activities they would have the opportunity to drop in and explore some of the items we had provided and ask any questions. We had assembled a wide range of equipment acknowledging that it might be attacked by young inquisitive hands.

Then we had the 'nod' our first group were on their way. I'm not sure we were totally prepared for what happened next (certainly Doug was taken by surprise.) Thirty very small individuals streamed into the room and made a direct assault on the various telescopes and binoculars. It did not seem to matter which end they looked through or how large they were. If they could not reach – no problem – just scramble up the tripod! They disappeared just as excited as they had arrived; we hoped that we had something to do with that.

This process repeated itself throughout the day, lots of sitting and chatting interspersed with short bursts of manic enthusiasm, with the age range (from 6 to 13 year olds) of the students dictating the level of interaction and depth of questions. It was pleasing to see the high level of interest and the appreciation of what is involved in the field of amateur astronomy and Doug was in his element sharing his vast font of knowledge with anybody who dared enter.

We did have stiff competition in the form of a mobile planetarium where the young space cadets were exposed to a tour of the night sky exploring the Solar System and circumpolar stars. However we must thank Newport Girls High School for the opportunity to share our enthusiasm and for being such good hosts.

What next?

How do we maintain and sustain what is always an initial interest into an awe inspiring subject? Working with such youngsters it is vital that they have success and I keep asking myself what role has the SAS in all this. There are pockets of astro-clubs scattered throughout the county and maybe a directory would be useful.

Scouts (that includes girls these days) together with the Duke of Edinburgh have recognised skills activities and awards. The opportunity to continue building links with young people through similar events and the STEM network needs to continue and it must be acknowledged that a number of SAS members do take time out to share their enthusiasm.

Astronomy Clubs

Astronomy clubs meet at various secondary schools in Newport and other areas of Shropshire where youngsters talk and share experiences. In many instances they have access to a range of instruments, some of which may be borrowed including binoculars and some quality telescopes. These are used by the group or individuals over an extended period of time. There is even access to STEM ambassadors who give their time freely.

(Continued on page 5)

(Continued from page 4)

GCSE Astronomy

A wide range of students meet at various venues throughout the county, usually after school, to improve their knowledge of Astronomy. They work towards gaining a recognised qualification which could lead to further studies.

This is often run by enthusiastic teachers in the schools.

Project Moon

To inspire young stargazers it is proposed to construct a model moon about 75cm in diameter, made from Plaster of Paris. It would include a low relief surface constructed by groups of young pupils from direct observations over an extended period of time. The project is open to learners of all ages within the Newport network and specific instruments, together with expertise are available to primary schools by arrangement. Tibberton Primary School are first out of the stalls and will champion this project this coming September.

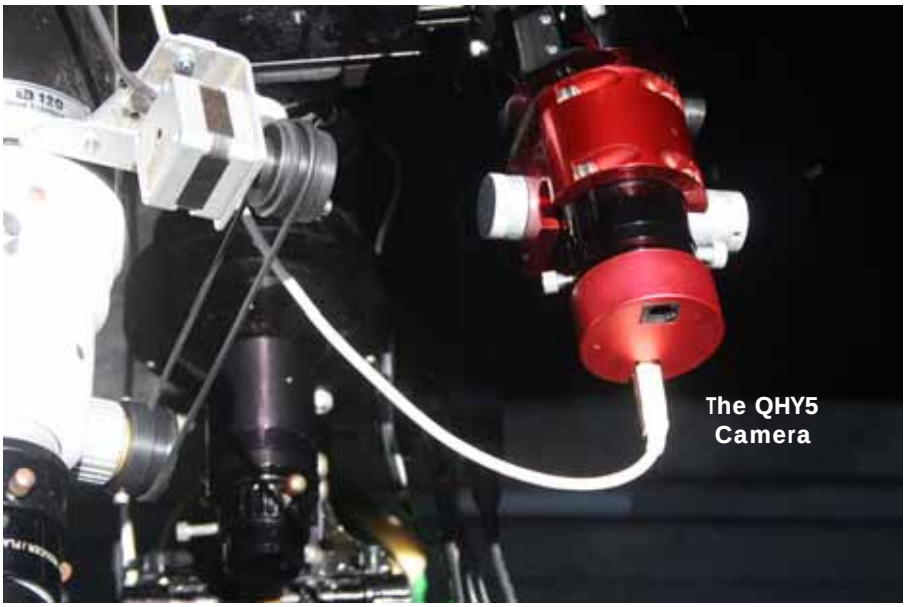
Watch this space!!!

Courtesy: HERMES

Credit where it is due

- real technical assistance when you need it

Like many who try our best at astroimaging I have several cameras. Whilst we tend to think of our main imaging camera as our prime piece of kit, we tend to somewhat overlook the importance of the camera we use for guiding. It works away doing its stuff and we only really notice it when it fails. Such was the case with me when my QHY5 refused to work.



The QHY5 Camera

Of course, when I checked, it was out of warranty so I was on my own!!

The symptoms of the failure were that whilst the PC acknowledged the camera when plugged into a USB port, it failed to check for drivers and asked me to find them. I tried reinstalling the drivers and software to no avail and every time said that the unknown device had not loaded properly.

The QHY5 was tried on both my laptop and the office PC receiving the same response from them as my observatory PC. So what to do now?

I then went onto the website of the manufacturers - www.qhyccd.com - and tried updating the various drivers and software, with no success. This left me in the hands of technical support and my limited experience of 'remote help' did not fill me with confidence. Accordingly I hit Contact' and saw that for technology support it would be necessary to Submit a Ticket.

Clicking the 'Submit Ticket' link brought up a dialogue allowing you to give details of the problem. I filled this in and sent it on its way more in hope than expectation.

Within several hours I received a response asking me to check the unknown device's VID/PID. I was mystified by this but going into the relevant entry in Device Manager I found the data asked for, which I sent back next day.

A couple of days later the response from QHYCCD said that the problem can be sorted remotely by software/firmware. They also said that they will send a document to show how a small modification will prevent this problem happening again. There was a minor problem in that they asked me to install some software called Teamviewer 5.0 on a Windows XP PC and contact them via their Yahoo Messenger.

The problem was that my office PC uses Windows 7, so I would have to use the one set aside for Joe, my young grandson*.

I downloaded Teamviewer 5.0 and was pleased to see that there was no cost for private use. I installed the camera software and set up Yahoo Messenger.

Eventually at about 7.30pm last Saturday evening I made contact with them and they said they would transfer a couple of files to me, the second of which failed, possibly due a slow link. However I discovered that the file was a .rar and on Joe's PC I had no utility to open it. Whilst I was trying to locate and download software to unzip, the person at QHYCCD indicated no problem and said that he had made contact via Teamviewer and would transfer the unzipped file instead.

He then asked if it would be OK for him to open up these files, which had been put on my Desktop. I confirmed this and watched in some amazement as the mouse cursor moved about the screen 'on its own'.

The driver file was opened and various entries for '1618' were amended to 'ff18'. The VID/ PID file was then opened and some further amendments made.

Both these files were then installed and once installed the PC immediately recognised the QHY5 camera when it was plugged in.

Unfortunately I could not prove the camera operation at that time as I had no suitable imaging software installed.

The man at QHYCCD then sent me a pdf file regarding a small camera modification and we said goodbyes with him saying he needed to get to sleep!.

I then took the camera up to the observatory and plugged it into the PC and found that it was working.

The next morning, Sunday, at about 9.30 a.m. I logged into yahoo messenger and saw that QHYCCD was online. I said hello and explained that the camera was now good and thanked him for his efforts. I said that I was Editor of the FAS Newsletter and would like to report my experience with him and if agreeable would he tell me his name and where he was based. He came back to say that he is Dr Quihongyn, usually known as Dr Qui, and is the designer of the range of QHY cameras. He is based in Beijing, China.

It is no wonder he needed to get to bed on my Saturday evening!! It was 3.00-4.00a.m. for him.

I have to admit being very impressed on a number of accounts. When you consider the time difference between the UK and China he was certainly burning the midnight oil during the time of sorting out my camera. Also if I had an SBIG or Starlight Express camera, I doubt that the chief designer or Managing Director would be the one up in the middle of the night to assist a user of a very modestly priced camera.

The pdf document revealed that the problem was probably caused by a low voltage from the USB causing the eeprom on the camera to be changed slightly. This made sense because I did have some trouble with my USB hub about then. Something for us all to watch out for, I think.

The recommended mod to the motherboard would prevent this happening again. To undertake this mod it is simply a matter of unscrewing the camera top, cutting a pcb link and connecting two contacts. A reasonably simple procedure, if only I could unscrew the casing without leaving any nasty scratches in the sexy maroon anodised finish!!!! - I'll keep you posted.

I would like to take this opportunity to thank Dr Qui for his dedication to his product, the patient way he handled my lack of abilities with the computer and, of course, for sorting out the camera!

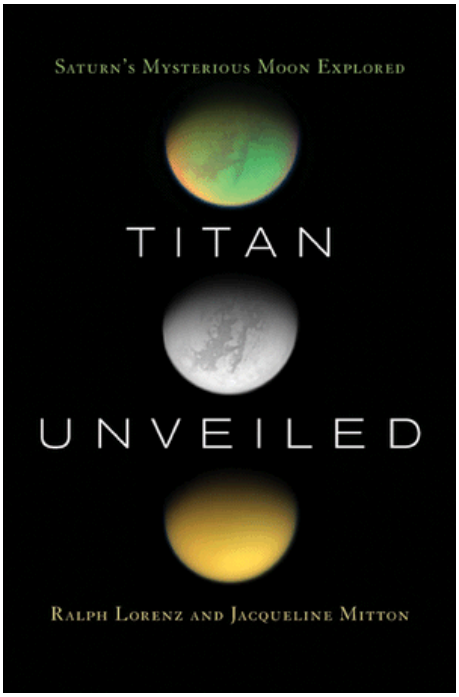
Frank Johns

Bernard Karpinshi of Modern Astronomy informs me that the latest versions of the QHY5 camera now have the eeprom isolated to prevent such an occurrence.

Book Reviews

TITAN UNVEILED – Saturn's mysterious moon explored.

By Ralph Lorenz and Jacqueline Mitton.
ISBN 978-0-491-14633-1. Princeton University Press. $19.95 (£13.00)



A very different book from the recently review Europa, some 265 pages, but nevertheless just as valuable.

It is written by Ralph Lorenz one of the researchers on the Cassini-Huygens mission and Jacqueline Mitton the well known astronomy writer. Cassini was launched in 97 but it was not until 2005 that the Huygens Probe parachuted down through Titan's atmosphere to land successfully on its surface.

Titan is a large moon some 5,000 km across – it has an atmosphere, all the ingredients required to make for a challenging and possibly rewarding target.

The book covers the whole project from before Huygens landed through to the analysis and to the results by many scientists. It has authority and accuracy because Lorenz actually worked on the project His contribution is written into the story as a Log or diary. UK readers will be especially interested because one of the important instruments had as its PI John Zarnecki OU Professor and well known to many astronomers.

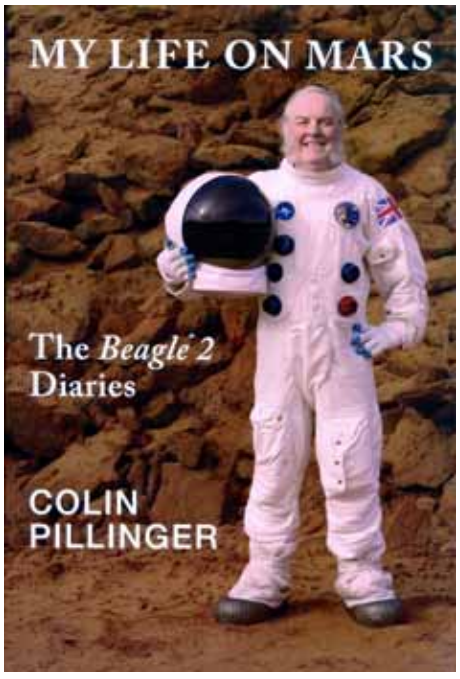
As a resource it carries a useful "Further reading" section including Academic reading and On line resources. There is also a 20 page Afterword a review and reflection of what has been achieved and anticipation of what might be discovered in the future.

This book will make an excellent gift for any one wishing to make a career in the space industry as it details the highs and lows of the scientist's life. Indeed it is a suitable source book for any lecturer looking for a different topic for his next astronomy society presentation. The level of the analysis of the experimental work is sufficient for most general scientists and still it is presented in a readable and interesting way.

Brian Sheen
Roseland Observatory

My Life on Mars: The Beagle 2 Diaries

by Colin Pillinger
ISBN 978-0-9506597-3-2, British Interplanetary Society £20.00



Seven years have passed since *Beagle 2* went missing on Christmas Day 2003. Equipped specifically to detect evidence for life and with the latest miniaturised mass spectrometer that Colin Pillinger had developed over many years of working with meteorite and Apollo lunar samples, this was to be the first and best opportunity to analyse Martian soil that had ever been flown. The science was sound, the instruments were well designed for the job and extreme care was taken to ensure that any positive results would not be contaminated from Earth-born organics. Launched from Baikonur six months earlier, 2 June, aboard a Soyuz-Fregat rocket as part of the European Space Agency's *Mars Express* mission, *Beagle 2* deployed successfully as the spacecraft reached the red planet, began its descent ...but then nothing more was heard from the lander. It has not been found and what caused the mission failure can only be conjectured.

This is Colin Pillinger's personal account of his dream to put a *British* lander on Mars to search for life. But it's more than that, it's the story of Pillinger's tenacity to succeed, inherited from a working class family going back over two hundred years in a Bristol suburb. He was determined to overcome the obstacles posed by having to personally raise funds and get sponsorship for an audacious Mars mission that ESA was only grudgingly willing to support. He certainly inspired the British public and media into giving their backing for the mission but his story is fraught with setbacks from individuals and scientific organisations that could otherwise have, just possibly, increased the chance of *Beagle 2* succeeding. It makes frustrating reading to learn of the backbiting and infighting by certain individuals and the generally lacklustre ESA support for Pillinger and his team for a mission that from its inception deserved to have had more British and European encouragement and financial backing at a government level. There is a useful list at the back of the book of who's who, a Dramatis Personae, both supporting cast and nitpickers, however one gets the overall impression that 'space research' and 'British Government' made for uncomfortable bedfellows.

Beagle 2 was lost and Colin Pillinger was taken to task for *his* poor management of the project. The subsequent inquiries tried to lay the blame for mission failure at his door with an attitude of 'we knew it would never work', 'it's your fault', and 'there, we told you so'. Pillinger's story is typically that of the British Bulldog with a big idea that gets put down when it goes wrong. Had the mission succeeded, it's interesting to speculate on how much of the credit would have been claimed by those who would not have deserved it.

This is a book that had to be written to set the record straight, albeit from one man's perspective, and it is well presented. Pillinger very rightly waited to allow the dust to settle and any prospects of European follow-up missions to shake out; but there haven't been any. The publisher, the British Interplanetary Society, seems at first an odd choice but this book does fit comfortably with their long tradition of promoting British space research. There are a few typos but nothing to detract from the narrative. This reviewer's only irritation is the constant use of initials for the many organisations mentioned, there are 26 of them; OU for Open University, ESA for European Space Agency, etc. The jargon buster at the end of the book helps but their constant use does make the reading of this book, with its important detail of who did what, somewhat laborious.

Colin Pillinger is to be praised for his vision and commitment to a project that few would have dared to tackle.

Kevin J Kilburn FRAS
The Society for the History of Astronomy

Local Astronomers Scoop Top National Prize - Again

Mexborough & Swinton Astronomical Society, a local educational charity, was celebrating today after scooping top prize in a national competition which recognizes best practice in the online publication of charities' annual reports and accounts.

The Charities Online Financial Report and Accounts Awards are sponsored by the Charities Aid Foundation and The Institute of Chartered Accountants in England and Wales (ICAEW) the aims of the awards are to: increase transparency, reward best practice in financial accounting, and raise the standard of web-based annual reports andS accounts.

The Society's Annual Report and Statement of Accounts to March 31st 2009 was joint winner in the category of Charities with an income below £100,000. The Society is no stranger to success having won first place in last year's competition.

The Society's website, at www.msas.org.uk, has been described by the ICAEW as "starry example of a small charity website that consistently punches above its weight". The panel of judges were clearly impressed by the site stating that it offered "excellent levels of interactivity" and is a "stunning example of what charities should be doing".

The Society carried off a certificate and prize money of £2,250 but more importantly, took away valuable feedback and recognition.

Society Chairman Les Marsden commented "To win the competition for the second year in succession is fantastic. Whilst the cash prize is a real boost it's the recognition of the hard work we put in to running our Society in an open and transparent way that really matters – our supporters can have real confidence in what we do."

Trustees of Mexborough & Swinton Astronomical Society with the winners certificate at the 2010 Charities Online Financial Reports & Accounts Awards.
Back row (L-R): Glenn Marsden, Mick Collinson, Gary Gawthrope

Mexborough & Swinton Astronomical Society is a registered educational charity its objects are to promote education in astronomy and its associated sciences for the public benefit. Contact for further information is Shaun O'Dell on: 07714 093723 or shaun@msas.org.uk. For further information please visit the Society's web site at www.msas.org.uk.

Guildford Astronomical Society Observatory Complex

Mullard Space Science Laboratory, Holmbury St Mary, Surrey

The picture shows the two observatories belonging to Guildford Astronomical Society sited in the grounds at Mullard Space Science Laboratory, Holmbury St Mary, Surrey.

One is the conventional dome type building and the other which is newly built, is a wooden roll-off roof shed type.

Further details on the Guildford AS will be found on Pages 10 & 11

Why don't you tell the rest of the astronomy community about the facilities and activities of your society.

Editor

LIST OF OFFICERS 2009/2010

President, Secretary, Treasurer & Newsletter Editor	-See Page 1	*Meetings Sec:*	Shaun O'Dell (see details on Page 1)
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		Yorkshire Group :	Paul Harper

Deadlines for submission for the next newsletter: Winter 2010 — 12 November 2010 Please remember to send ALL items to the Editor.
Material can only be returned if supplied with a SAE.

More images from the FAS Convention 2010

Clockwise from top left:

- Dr Peter Wheatley
- Jerry Stone & Richard Sargent
- Bob Dryden & Steve Owen
- Professor Phillipa Browning & Callum Potter
- Professor Tim Naylor

Mullard Space Science Laboratory Open Day

Holmbury St Mary, Surrey 4th September 2010

Jan Young, Worthing Astronomers

Mullard Space Science Laboratory, Holmbury St Mary, Surrey *Picture © Jan Young*

Now in its sixth year, Mullard Space Science Laboratory, sited close to Hombury St Mary, Surrey held its annual free entry open day on the first Saturday of September. Members of Guildford AS were on hand with solar telescopes, though unfortunately unlike their event in July, the Sun was not completely clear due to hazy clouds, and were giving tours around their two observatories sited in what was once the kitchen gardens of the house. One of their buildings is the normal dome type the other a roll off roof wooden shed which has only been completed during the summer of 2010.

Lectures were given during a particular time, these consisted of a number of speakers giving fifteen minute 'bites' which made a great variety.

A children's tent was on hand to keep the youngsters amused (though there were many adults who viewed this with interest), ice creams and burgers were available as was a well stocked bar selling alcoholic beverages alongside as teas and coffees. A replica of the Mars Rovers was on show and it actually moved across the lawns though it did seem rather keen to return to its parking tent!

Inside was a static display alongside some small demonstrations, one explaining the make-up of comets, another demonstrating how infra-red telescopes, namely the new Herschel telescope, 'sees' their subjects and the stair well taken up with a full scale rocket.

The grounds surrounding Holmbury House contain many magnificent plants and are very enjoyable to stroll around, with the most spectacular views to the south.

This is a very enjoyable event and certainly one that can be highly recommended. Apart from

Guildford AS, other SAGAS societies were represented, the latter due to the announcement of the event given at the SAGAS Summer meeting by speaker Alison Wallace of MSSL.

Very many thanks to the staff at Mullard Space Science Laboratory for all their hard work in providing such an enjoyable afternoon free of charge.

Mars Rover At 'MSSL Crater' *Picture © Jan Young*

More from:
Mullard Space Science Laboratory Open Day

Displays & Activities For Visitors *Picture © Jan Young*

Display Of Guildford AS *Picture © Jan Young*

Spectroscopy – A real possibility

By Ian Baker

Introduction

Every year at this time with the summer months drawing to an end and the thought of longer evenings, my thoughts turn to my plans for the winter and what I want to do with my hobby. I have seen some of the wonderful images that have obviously taken many hours of patience and care. These often inspire me to have a go at this but I have never produced anything to compare to those I have seen on other peoples web sites. Other people have spent the year surveying the skies in the search for Supernova or near earth objects. This takes just as much dedication as high quality imaging; the telescope operators hunched over their computers using blink comparators to sift through vast amounts of data hoping to make a discovery.

It was three years ago that I decided to do an Open University course S282 Astronomy. It brought home to me what an amazing hobby astronomy is and what potential it could have. I had always enjoyed the night sky and had enjoyed taking images with my trusty CCD camera and looking through the telescope but I had some questions I wanted answers to:

- What makes the stars different temperatures?
- How can you tell that stars like Betelgeuse is a red giant and not just a small red star close to us?
- Can I actually do some of these experiments to find out the answers with my telescope?

The answer to my questions was answered in one word Spectroscopy. This was to provide a new and exciting direction for my hobby and one that I have further developed over the following years until now.

The Design of the Spectrograph

I looked at what was available commercially; the cost of these instruments was quite high. One cost effective solution was a star analyser developed by Robin Leadbetter but at the time I didn't know anyone who had used one and was unsure about investing in it. I looked at what Maurice Gavin and Christian Buil had shown on their web sites. They were doing the kind of experiments I would like to try and so I decided to try and make a spectrograph.

I set about to find out about the design of a classical spectrograph. I realised that a lot of what I had assumed about spectrographs was in fact completely wrong. But with help from a number of people I started to understand the different parts of the spectrograph and some of the issues that need to be considered.

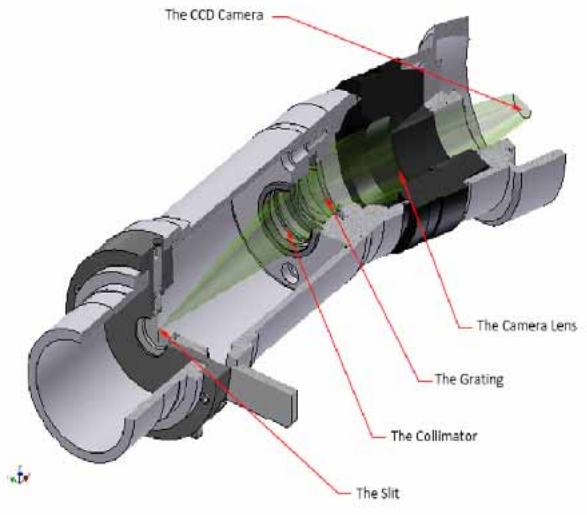

Figure 1 - The Layout of the Spectrograph

The Slit.

The slit is located at the focus of the telescope its size depends upon the astronomical seeing and the image scale of the telescope. It defines the resolution of the instrument.

$$\textit{Slit Size } (S_{CALC}) = I_{SCALE} \times AS$$

Where:

S_{CALC} = Slit Size
I_{SCALE} = Image Scale
AS = Best Astronomical Seeing

However, I found that it was easier to use the instrument without a slit. This meant that seeing alone defines the resolution of the instrument but makes it much easier to use. The negative impact of this simplicity is that for extended objects such as nebulae or galaxies it is harder to obtain the defined spectra as there is no separation between the diverged wavelengths as the images for each wavelength blur with their neighbours.

The Collimator.

The collimator lens can be an achromatic doublet from a pair of binoculars. Its focal ratio has to be matched to the telescopes f-ratio. So if the telescope is f6 the lens should be f6. It should be placed at a distance equal to its focal length from the slit or the telescope focus. The lens should be orientated so that the collimated or parallel light exists the fastest curve, as this will minimise any spherical aberration. The collimator should be sized to ensure that the beam exiting the lens illuminates as much of the grating as possible. The diameter of the exit beam from the collimator (L1) is calculated by:

$$\text{Exit Pupil } L_1 = \frac{(D\ FL_2)}{f_L}$$

Where:

D = Telescope Aperture
FL_1 = Focal Length of the Collimator Lens L1
f_L = Telescope Focal Length

The Grating.

The grating is at the heart of the spectrograph. There are a number of different types and sizes with various numbers of lines which give varying amounts of diffraction. They can be loosely categorised into two main groups reflective and transmission. Each have their own advantages and disadvantages. There is a lot we could discuss about gratings, the type, their blaze angle, their efficiency, and much more but that is for another article. A good place to research is the Thor Labs website.

The grating causes the light from it to be diffracted this means that the light leaving the grating is bent. The formula to describe this depends on whether the grating is a transmission or reflective type.

For Transmission Gratings:

$$\sin \alpha - \sin \beta = k\ n\ \lambda$$

For Reflective Gratings:

$$\sin a + \sin b = k\ n\ \lambda$$

Where:

α = angle of incidence (i.e. 0 would be square on)
β= angle of diffraction
k = The diffraction order (usually equal to 1)
n = The groove density - grooves/lines per mm
λ = wavelength being diffracted

After some consideration I decided to use a 600 line per mm visible transmission grating as this would enable me to record the spectrum of a star from 420 to 680nm. This is a suitable range for spectral classification of stars. I orientated the grating in its Littrow position where the angle of incidence is equal to the angle of diffraction. Alternatively I could have used a 600 line per mm visible reflective grating.

However, I would probably have not used this in the Littrow configuration as the camera lens would lie on the same axis as the collima-

(Continued from page 12)

tor. In this case the grating may be orientated so that the spectrum being reflected off the grating is directed through to the camera lens without the beam being blocked or vignetted by the hardware. The rotation of the grating away from the Littrow position causes the image to be stretched anamorphically. The amount of distortion as a ratio of height to width is calculated below:

$$\text{Anamorphic Factor } (A_{NM}) = \frac{\text{Cos b}}{\text{Cos a}}$$

Another factor caused by the rotation of the grating is that as the angle of incidence increases so does the length of the grating that intersects the beam from the collimator. The length of grating intersecting the beam is calculated by:

$$\text{Grating Length (GL)} = \text{Exit Pupil } L_1$$

The table below shows how the angles of incidence and diffraction vary for the reflective and transmission 600 g/mm grating.

Reflective Grating			Transmission Grating		
D_v	α	β	D_v	α	β
0.000	9.497	9.497	18.994	9.497	9.497
5.000	7.006	12.006	19.013	7.006	12.007
10.000	4.534	14.534	19.068	4.534	14.534
15.000	2.080	17.080	19.160	2.080	17.080
20.000	-0.355	19.645	19.290	-0.355	19.645
25.000	-2.770	22.230	19.460	-2.770	22.230
30.000	-5.164	24.836	19.671	-5.164	24.836
35.000	-7.537	27.463	19.925	-7.537	27.463
40.000	-9.887	30.113	20.226	-9.887	30.113
45.000	-12.212	32.788	20.576	-12.212	32.788
50.000	-14.510	35.490	20.979	-14.510	35.490

Table 1 - A comparison of angles of incidence and diffraction for 600g/mm reflection and transmission gratings

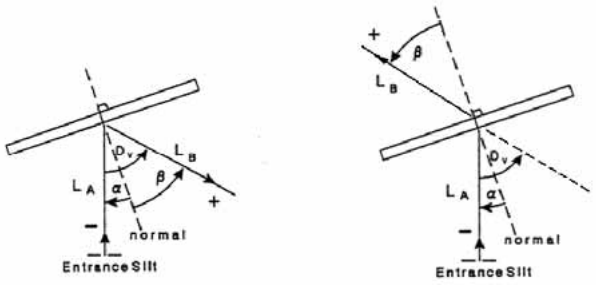

Figure 2 - Reflection and Transmission Gratings

It should be remembered that gratings are very delicate optical components and should not be touched, brushed or wiped, as this will damage the grating. A good tip is to wear a face mask and handle them using powder free Latex gloves, holding them only by the edge.

The camera lens

The requirement to design a suitable camera lens system from scratch is not one I relish. Also it cannot be thought of as being either a cost effective or simple matter. Luckily, there is a source of well corrected, near diffraction limited performance lenses that are more than suitable for this task. The SLR camera lens offers the level of performance required and if bought second hand can provide an excellent cost effective solution.

Unfortunately there are limitations. SLR camera lenses usually are usually only available in certain focal lengths and the f-stop is usually required to be very fast around f2 or sometimes less. I have found a great deal of success using old Nikon Camera lenses.

The choice of camera lens will influence a number of factors. As with most designs it is a matter of balancing the different components to obtain an optimum performance. The calculations shown below illustrate how the position, focal length and the focal ratio of the camera lens L_2 affect the design.

$$\text{The Pupil Entering the Camera lens: (Pupil } L_2) = GL.A_{NM} + \left(\frac{T \,.\, P_{ix} \,.\, P_w}{fL_2} \right)$$

$$\text{Focal Ration of Camera Lens (f\#T2)} = \left(\frac{fL_2}{PupilL_2} \right)$$

$$\text{Size of Projected Slit } P_{SLIT} = \frac{S_{CALC} \left(\frac{fL_2}{fL_1} \right)}{A_{NM}}$$

Where: GL = Length of Grating Intersecting the Beam
ANM = Anamorphic Factor
T = Distance from the Grating to the Camera Lens (L2)
P_{ix} = Pixel Size of Detector
P_W = Width of Detector in Pixels
fL_2 = Focal Length of Camera Lens (L2)
fL_1 = Focal Length of Collimator (L1)

The detector could either be a simple eyepiece with a focal length of between 25mm to 40mm should gives sufficient field of view to allow for visual observing, or a CCD camera that allows the stellar spectra to be recorded.

The format and size of the CCD camera does affect the design of the spectrograph and should be carefully considered. In many ways the detector is both the starting point and the end point in evaluating the design.

The pixel size of the CCD affects the size of the slit. A correctly sampled image of the projected slit should be at least 2 pixels wide. The size of the projected slit is determined by the ratio of the focal lengths of the collimator and camera lenses, and size of the slit. This in turn is dependent on the image scale of the telescope and the astronomical seeing.

It can be seen therefore that the design is an iterative process. The aim is to balance the different components to obtain a solution that ensures a correctly sampled projected slit whilst not having too wide an entrance slit.

The Next Step...

This type of design lends itself to a spreadsheet and there is one created by Christian Buil that is fantastic. It calculates each of the parameters discussed and a few more! It then allows the design to be tweaked. Once the grating angles and lens positions have been determined then the plans for construction can be drawn up.

The materials can be varied many amateurs have constructed complex spectrograph designs from plywood others have used aluminium sheet. The complexity and materials really depend on you the designer. The important issue is to ensure the final design is lightweight and rigid and of course that it fits your telescope...

Appendix

Web Sites to visit for research:

For Design:

Christian Buil's Site : http://www.astrosurf.com/~buil/

Ken Harrison's Site : http://www.iceinspace.com.au/63-339-0-0-1-0.html

Robin Leadbetter's Site : http://www.threehillsobservatory.co.uk/astro/spectroscopy.htm

Maurice Gavin's Site: http://home.freeuk.com/m.gavin/foth.htm

Ian Baker's Site: http://scopes.wikispaces.com/Astronomy+Projects

For Optical Components:

Thor Labs. - http://www.thorlabs.com/navigation.cfm?Guide_ID=9

Edmunds Optical - http://www.edmundoptics.com/onlinecatalog/browse.cfm?categoryid=167

Surplus Shed - http://www.surplusshed.com/

CVI Melles Griot - http://www.cvimellesgriot.com/

Courtesy: LAS Newsletter

Turning the Pages of Astronomical History

A Visit to the Royal Astronomical Society Library- June 5th 2010. By Gerard Gilligan.

During the Spring Conference of the Society for the History of Astronomy, held at Chatham's Library in Manchester last February. The Librarian of the RAS, Peter Hingley invited me and some guests, to travel to London to visit the Library itself. Well I was not going to let this opportunity pass me by. Peter had noticed that some of the LAS member portraits used in my conference presentation, where of poor quality. So Peter suggested that I scan the 1883 originals held by the RAS in the Library. I also asked Peter if I may examine the original observational note books of William Lassell (1799-1880). He being the Liverpool

Victorian Brewer and astronomer. Who among many discoveries, was the first to identity Neptune's large Moon Triton from Liverpool in October 1846. Peter's reply to this question was on the lines of "*.....Lassell? We're got boxes of stuff on him.....*" I remember booking my train ticket just a few days later!

The Royal Astronomical Society has a world-class collection of astronomical books and periodicals, some 10,000 in total. Only the Royal Observatory Library in Edinburgh has more. The RAS Library houses 5,000 items that where published before 1851. The Library receives some 300 current periodicals, and conference proceedings in astronomy and geophysics. So this Library is thus a major resource of considerable value not just to the RAS, but to the wider community of astronomers, geophysicists, and historians of all the sciences, not just astronomy.

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William Lassell 1799-1880

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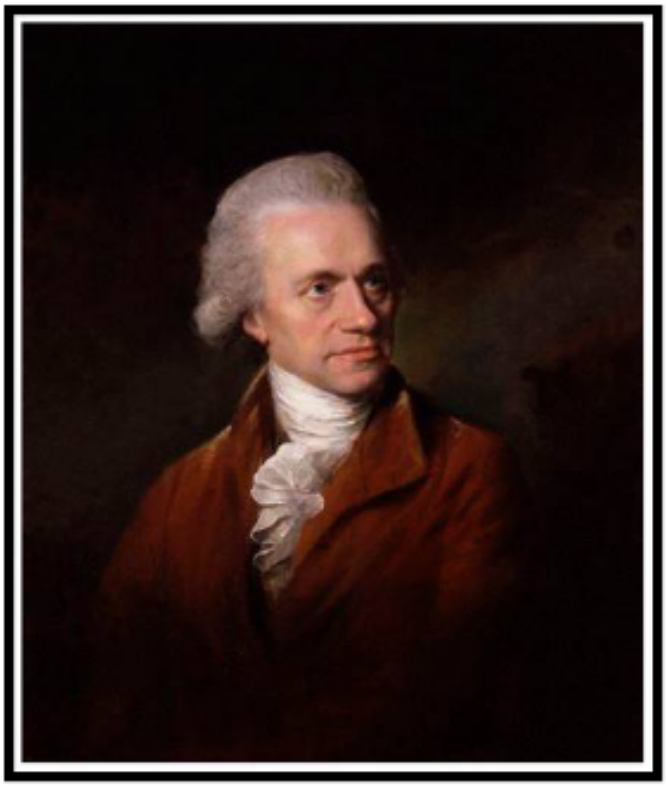
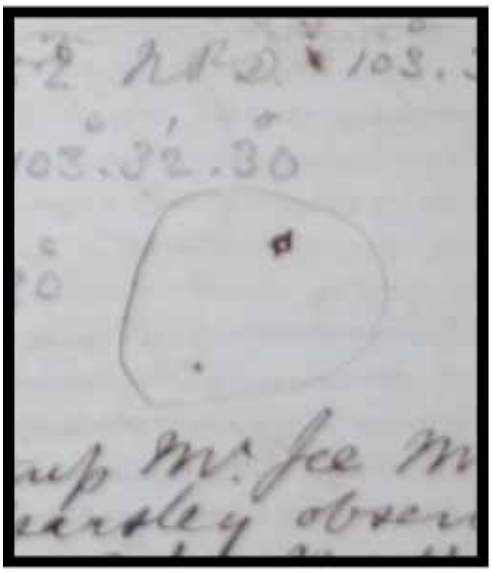


Sir William Herschel 1738 -1822

I was accompanied on my journey to London, by fellow LAS members David Galvin, and Rob Johnson. Mr Galvin was just happy to have the opportunity to visit the RAS Library for the first time. However Mr Johnson had expressed the wish to see some of the observations and materials of astronomer and musician Sir William Herschel. Particularly the events surrounding his discovery of the Planet Uranus on March 13th 1781. Again Peter indicated this was no problem, once we could locate the references from the detailed catalogue by Bennett and published in 1973.

The train journey to London was relatively uneventful, and I'm glad to say speedy, as was the Journey across a busy capital city via the underground. We arrived at the door of the RAS less than 3 hours after leaving Runcorn. The Royal Astronomical Society Headquarters are situation in Burlington House, Piccadilly, and share the same part of a larger building with the British Astronomical Association, and other scientific organisations. Peter welcomed all three of us and we signed in. The Saturday opening for the Library is new for 2010, and is arranged for every third Friday of the Month, except on Bank Holiday weekends. We were then lead upstairs to the main reading room of the library, and our trip into the time vortex of astronomical history began.

As indicated before we where required to find the particular library references and dates of observational books and letters from the library catalogue, so that Peter could extract them from the massive biographical archive. This archive also includes portraits, telescope



Lassel's November 10th 1846 drawing of Neptune & Triton system

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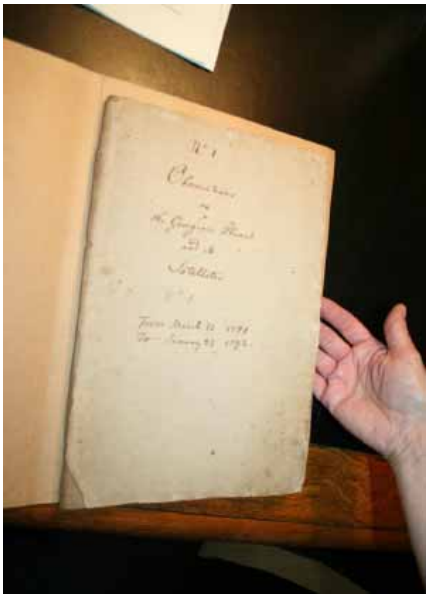

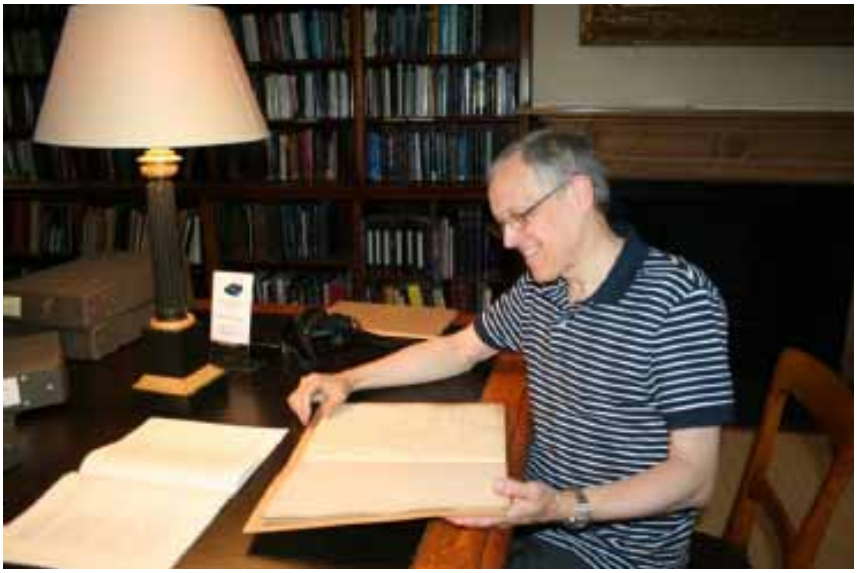

and observatory histories, Venus and Mercury transit observations, and solar eclipse expedition's records.

Peter brought several boxes of Lassell's original observations into the reading room, and for me it was like the scene from *"Raiders of the Lost Arc"*, when they open a long lost tomb. We where taken by surprise when Peter advised that the protective gloves used to examine historical documents, would do more damage, so we handled the documents with unprotected hands, as you can see.

I quickly found the pages in Lassell's note book, during the period September to October 1846.

Neptune's discovery was made by two astronomers, Galle & D'Arrest, working at the Berlin

Observatory. Using a predicted location, the blue planet was first seen on September 23rd 1846, and the news of the observation reached England, several days later. It was William Herschel's Son John who wrote to Lassell asking him to observe the newly discovered Neptune, and look for satellites.

However, it should be noted that Neptune was for several more years referred to as "Le Verrier", after Urbain Le Verrier who had provided the predicted location of the planet and as Lassell's notes indicated he had first turn his telescope towards Neptune on October 2nd, and suspected a ring around the planet. But one week later, October 10th with the bright moon out of the way, he saw for the first time its large satellite, later named Triton. On November 10th his note books show this small drawing, with Triton indicated as a pen dot at the bottom left hand corner, with an elongated Neptune with its ring that Lassell discovered later was caused by the heavy speculum mirror distorting the image.

One event Lassell recorded was that with several visitors to his observatory, he observed all known planets at Sunset in a western line up on 13th January 1844. However later investigations by Dave and Rob, with computer planetarium programs, for example *Starry Night Pro©*, indicated that the planet Saturn would have set by the time of astro twilight (-18 degs). There was not enough darkness for it to seen against a darkish sky. We also noticed Lassell's observations of the transit of Mercury on May 8th 1845, a very deep partial solar eclipse, and several comets. An indication that he did not confined himself to just the planets, and would testing his optics on the Moon when the Liverpool weather would allow. Things don't change then!

Meanwhile, Rob Johnson, had been presented with the archive boxes containing the Herschel

observational books for the period around his discovery of Uranus in March 1781.

William Herschel was, as most newsletter

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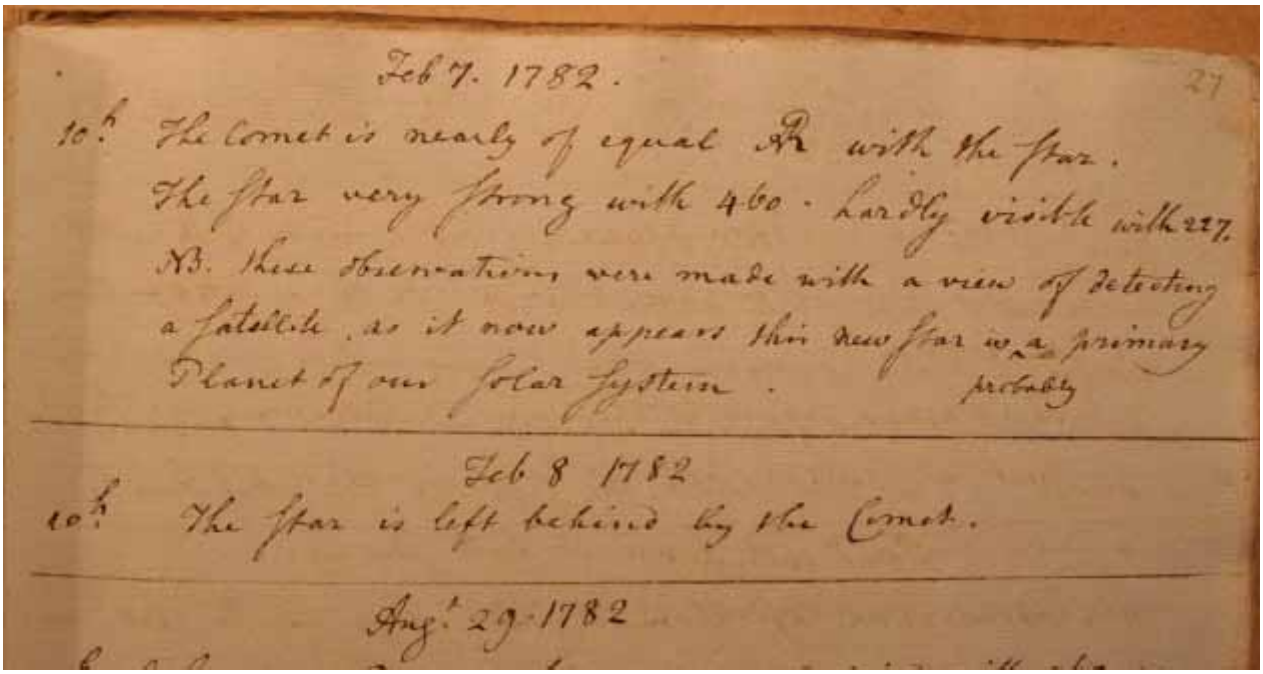


Feb 7. 1782.

10h The Comet is nearly of equal R with the star.
The star very strong with 460. Hardly visible with 227.
NB. These observations were made with a view of detecting
a satellite, as it now appears this new star will be a primary
Planet of our solar System. probably

Feb 8 1782

10h The star is left behind by the Comet.

Aug.t 29. 1782

(Continued from page 16)

Reader's will know, a very accomplished musician, as well as astronomer. He was also a very skilled telescope maker, and cast his own speculum metal mirrors. While using one of his telescopes, one of 6.2 inches aperture, with a focal length of 7 feet, on a clear night in March 1781 he was conducting a survey of stars down to eighth magnitude. While examining stars in the constellation of Gemini, he came across something which at first he indicated to him as a new comet, and appeared to move appreciably against the starry background. Once his observation had been made known to others, like the Astronomer Royal, Neville Maskelyne, Herschel was able to have his observation confirmed, and he also produced an official paper. His friend Dr William Watson was able to communicate it to the Royal Society on the 29th April, which was headed *"Account of a Comet"* By May 1781 there was no longer any doubt that Herschel had added a new planet to the Solar System, which Herschel preferred to call *"Georgium Sidus"*, or *"Georgian Planet"* in honour of King George III, but Uranus was the final choice.

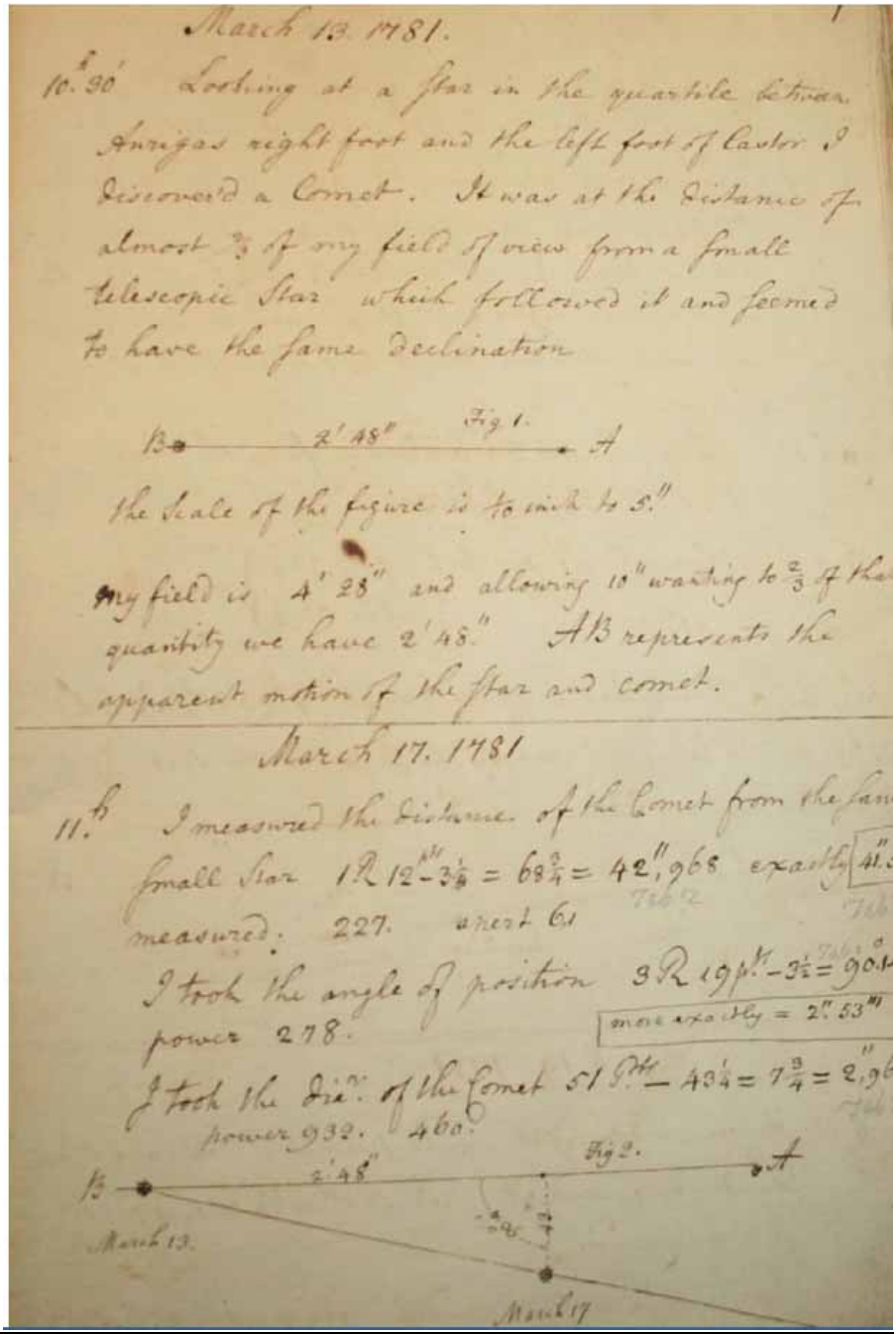
Herschel's note of February 7th 1782, when his observations of some of the new Planet's satellites confirms that he had indeed added to the solar system, the first telescopic discovery of a planet.

Rob, Dave, and I continued to look through as many of the note books, and letters as we could, but our time in the library was coming to an end.

Peter invited the three of use to join several other visitors and we toured the remaining parts of the RAS Headquarters, and we viewed several other historic star and lunar atlases.

I really fascinating time, and we plan to return next year, and turn more pages of history.

Courtesy: LAS Newsletter



March 13. 1781.

10.h 30' Looking at a star in the quartile between Auriga's right foot and the left foot of Castor I discovered a Comet. It was at the distance of almost ⅔ of my field of view from a small telescopic Star which followed it and seemed to have the same Declination

Fig 1.

B ——— 2' 48" ——— A

the scale of the figure is to inch to 5'.

my field is 4' 28" and allowing 10" wanting to ⅔ of the quantity we have 2' 48". AB represents the apparent motion of the star and comet.

March 17. 1781

11.h I measured the distance of the Comet from the small Star 1R 12m − 3½ = 68¾ = 42",968 exactly 41."

measured. 227. erect 61

I took the angle of position 3R 19p.t − 3½ = 90.°

power 278. more exactly = 2° 53'

I took the Dis.r of the Comet 51 P.ts − 43¼ = 7¾ = 2",96

power 932. 460.

Fig 2.

B ——— 2' 48" ——— A

March 13.

March 17

An Eventful 12 Months for Shropshire AS

Mandy Bailey reviews the year

Well what an eventful year we've had! As my time as temporary chairman comes to an end, I must say that although I stood in as the named chairperson, the credit for keeping the Society moving forward as successfully as it has done must go to the rest of the committee – without whose support the SAS could not have achieved all it has this year. The smooth running of our Society is down to the team spirit of the committee.

Following our successful events during IYA2009, this year's activities, over and above our normal observing sessions, have been centred on outreach activities. By doing this we hope to encourage more people in Shropshire to look up and enjoy our wonderful skies; hopefully inspiring people to take up our fascinating hobby and particularly hoping we can perhaps inspire at least one young person to become a professional astronomer.

As most of you know, I am a Council member of the Society for Popular Astronomy, so it is no wonder I involve them in what we do as much as possible. The Starting from Scratch meeting in Shrewsbury in June was a great success for both parties, and although my work took me out of the country for that event, I know Robin Scagell from the SPA was very impressed by the welcome and help he received to run the day – again all credit to the committee and all helpers.

In August we took part in the Meteor event run at Carding Mill Valley by the National Trust. I gave a lecture on Meteorites and then the heavens cleared, giving us some of the best views of the Perseids in the country. Naturally our ever willing members turned up with telescopes to help show other wonders of the night sky – a splendid view of Jupiter for instance – to the attendees of the event even though of course telescopes are not needed for watching meteor showers.

Our Summer Social followed which was greatly enjoyed by all there; the rocket building and launching was a great success and led to a lot of hilarity, thanks to Steve Szwajkun for organising that.

The big event of the autumn was our first annual showcase lecture by Professor John Zarnecki from PSSRI The Open University. John's talk was on Titan – the Moon that would be a Planet and it was held at Meole Brace School Science College.

This was one of the best-attended talks we had arranged, certainly since I can remember being a member and there was a wide range of people who came along. John thoroughly enjoyed his time with us and was very impressed by the quality of the questions that were put to him, especially by the younger members of the audience. He commented to me at one time that I hadn't warned him Shropshire people were such a knowledgeable lot and would ask such hard questions!

The one topic that he talked about – even on the following day – was the question put to him by a young lad wanting to know if there were rainbows on Titan, and if so what would they look like; this was one of the best and most difficult questions John said he had ever been asked about Titan. I think it would make a good title for his memoirs: 'Are there rainbows on Titan?' (if he ever

(Continued on page 19)

Louise Parsons and Geoff Puplett of Meole Brace School Science College, Professor John Zarnecki of the Open University and Mandy Bailey, Chair SAS

(Continued from page 18)

does them) and I will suggest this to him when I see him next.

A few weeks later we ran our Moonwatch at Attingham Park, which we are hoping to make an annual event, and folks, you were brilliant. The weather on the Friday (and even worse on Saturday) was not good, yet you turned up with your telescopes and binoculars. Even when there was nothing to see you managed to enthuse our visitors and all left happy if a little disappointed at not seeing anything.

The fantastic job you did that night bore fruit on the Sunday which was an amazingly clear observing night, and many of the people who had turned up on the Saturday came back to look through the telescopes.

If you all hadn't have done such a brilliant job on the very cloudy and rainy Saturday night this simply would not have happened. Well done all.

Various members of the society have also helped about at astronomy nights in schools, particularly Meole Brace and have attended summer camps and Brownie packs to help youngsters learn about the stars and planets. Of course, alongside these special events, we run our regular observing sessions at Rodington and at Ford; attendance at these largely depends on the weather but I must say a very special thanks to Stan Courtney who is the cornerstone of the Ford observing sessions. They simply wouldn't happen without him.

It hasn't ended there, as I type I am finishing off a letter to go to the Shropshire MP's about the Daylight Saving Bill. Somehow the Mail on Sunday reporters got hold of this information – no one is owning up to me who spilt the beans! I have today given a telephone interview and something may be published in the Mail on Sunday on 28th November. If it is, I just hope I am quoted correctly as I ended up talking about the SPA and the campaign for dark skies too as all these have a viewpoint on losing the extra hour. It is an expansion of the letter being sent to the MP's, and as our outreach has really grown as a result of the IYA and the SPA initiatives, it all needed explaining. We will just have to wait and see with bated breath and fingers crossed if the message gets across in the right way.

Geoff Puplett and Louise Parsons with signed Cassini-Huygens poster supplied by John Zarnecki, won in the raffle by David Woodward who kindly donated it to the

Now what for our future? This is your society and the current committee want to continue with the outreach but we mustn't forget our long-standing members and we must look to what we do on our observing sessions. So, please let us know your thoughts.

What do you, our regular members, want from your society as we continue to move forward?

Courtesy: Hermes

Kelling Heath 2010 By Brendan Martin

Well it was that time of the year again and we were off to Kelling Heath for the Autumn Equinox Star party organized by Loughton AS, we had extended our stay this year by another day to six days as the previous year we were limited to clear nights for observing, by increasing the nights we hoped for a better chance of clear weather and we were not to be disappointed.

I arrived early on the Tuesday morning September 7th to find there had been heavy rain the night before which had caused a few problems for some especially poor Keith (Keith is from Thetford and has had a pitch opposite us every year) whose observing tent flooded through the night onto his electrics. After setting up my tent I had a nice relaxing day whilst waiting for Dave Owen and Geoff Regan to arrive, everyone duly arrived late afternoon the weather did not look to promising for that evening but as everyone was tired from their travels we were not to disappointed

but an hour or so after sunset it cleared quite nicely so out came the telescopes, I had my 10" Orion USA Dobs. F4.7 and Geoff and Dave had brought along their 20" f3.3 a good nights observing ensued highlight being the veil nebula eastern and western through both telescopes, using a UHC filter it was even better another favourite that evening was a small globular cluster ngc7006 which lies 4 times further out than M13.

By one-o-clock in the morning I was starting to flag as I had driven down through the previous night and had not slept since Sunday so I was off to bed.

The next day more members of the LAS arrived and the weather followed as the day before cloudy during the day but once again it cleared up in the evening and a good nights observing followed the same could also be said for Thursday.

Friday proved a bit of a washout during the day with rain until early afternoon and cloudy through the night but having had three observing nights already we were not to disappointed and we all looked forward to the trade stands on the Saturday although the weather forecast was not to promising, Saturday arrived and thankfully the weatherman was wrong. There were plenty of trade stands and second hand goods available, we had some funds available to purchase equipment on behalf of the LAS, everyone was in agreement that a stellaview binocular viewer with X2 23mm eyepieces was a desirable item and they were duly purchased and what a purchase they turned out to be.

During the day they organize a tour of the various telescopes of interest around the camp site for visitors and the LAS 20" was to be included in this tour as it had proved popular with people passing by who stopped to admire it,

Stafford AS actually filmed an interview with Dave Owen during the day about the 20". Saturday night was slow to start as it was cloudy till late but it cleared and we started to observe and try out our purchase and wow Jupiter was fantastic, we had to use a 2X barlow as my scope is a short focal length and one is required to achieve focus, we estimated the view to be about X250-300 magnification and the detail on Jupiter was incredible, later on in the evening a group of people who had asked if they could come back in the evening to look through the 20" arrived and whilst they were queuing to look through the scope I asked them if they would like to look at Jupiter through mine with the bino viewers and they were amazed and spent more time looking at Jupiter than looking through the 20" they said they had never seen so much detail visually before, my favourite object of the evening though was ngc 1491 a small nebula in Perseus, I had tried to find this earlier in the week but to no avail, I had seen it here at

Kelling the first time we came here but it had proved elusive ever since so I was very pleased to see it again. I packed in observing at about two-thirty in the morning as I had to be up early to pack away and drive home. This event never fails to please even last year when we only had one night observing, we have got to know a lot of people from all over the UK and it was nice to see them all again, it is a very friendly event and people are always pleased to talk and share we have already booked for next year and in fact more LAS members have booked and next year we are all on the same field (we are slowly taking over).

Members present were:- Brendan Martin, Dave Owen, Geoff Regan, Chris Regan, Dave and Camelia Galvin, Dave Bentley, Alan Dennott, Laurence Ashwoth, Dave Robinson, Lew Brown, Noel Rimmer,Ken Sharples, Steve Southern, Pete Rea,

Pictures courtesy Chris Regan

NASA Test Fires New Rocket Engine for Commercial Space Vehicle

NASA's John C. Stennis Space Center in Mississippi conducted a successful test firing on Wed., Nov 10, 2010 of the liquid-fuel AJ26 engine that will power the first stage of Orbital Sciences Corp.'s Taurus II space launch vehicle. The initial test, the first in a series of three firings, lasted 10 seconds and served as a short-duration readiness firing to verify AJ26 engine start and shutdown sequences, E-1 test stand operations, and ground-test engine controls.

NASA's John C. Stennis Space Center in Mississippi conducted a successful test fire of the liquid-fuel AJ26 engine that will power the first stage of Orbital Sciences Corp.'s Taurus II space launch vehicle.

The initial test, the first in a series of three firings, lasted 10 seconds and served as a short-duration readiness firing to verify AJ26 engine start and shutdown sequences, E-1 test stand operations, and ground-test engine controls.

The test was conducted by a joint operations team comprised of Orbital, Aerojet and Stennis engineers, with Stennis employees serving as test conductors. The joint operations team and other NASA engineers will conduct an in-depth data review of all subsystems in preparation for a 50-second hot-fire acceptance test scheduled several weeks from now. A third hot-fire test at Stennis also is planned to verify tuning of engine control valves.

"Congratulations to Orbital and Aerojet for successfully completing another major milestone," said Doug Cooke, associate administrator for the Exploration Systems Mission Directorate at NASA Headquarters in Washington. "This brings us one step closer to realizing NASA's goals for accessing low Earth orbit via commercial spacecraft."

The AJ26 engine is designed to power the Taurus II space vehicle on flights to low Earth orbit. The NASA-Orbital partnership was formed under the agency's Commercial Orbital Transportation Services joint research and development project. The company is under contract with NASA to provide eight cargo missions to the space station through 2015.

"With this first test, Stennis not only demonstrates its versatility and status as the nation's premiere rocket engine test facility, it also opens an exciting new chapter in the nation's space program," said Patrick Scheuermann, Stennis' center director.

"We're proud to be partnering with Orbital to enable the wave of the future - commercial flights to space and eventual resupply of cargo to the International Space Station."

In addition to the Orbital partnership, Stennis also conducts testing on Pratt and Whitney Rocketdyne's RS-68 rocket engine. The AJ26 is the first new engine in years to be tested at Stennis.

Operators spent more than two years modifying the E-1 test stand in preparation. Work included construction of a 27-foot-deep flame deflector trench, major structural modifications and new fluid and gas delivery systems.

Courtesy: SpaceDaily.com

Uncertain future for Dundee's Mills Observatory

Dundee's Mills Observatory - Britain's only public stargazing site - may be sold to a private investor as Dundee City Council bids to meet reduced budget targets.

The 85-year-old observatory costs the council only £46,500 a year to run but, in a bid to make £20 million of savings from next year's £330 million budget, the facility may be turned over to a private trust fund.

Supporters of the observatory, including Astronomer Royal for Scotland Professor John Brown and opposition councillors, argue that the Mills is an important educational resource for the hundreds of schoolchildren which visit it each year.

Professor Brown, said: "The Mills is a unique and very special place. It's a fabulous facility which has enhanced the city for decades. But I have long had concerns about its funding level and this latest 'crisis' comes as no surprise.

"I realise we are facing difficult financial times but the Mills is a great educational resource which has inspired generations of schoolchildren to pursue a career in science at a time when Scotland is crying out for such skills.

"The fundamental point is that the Mills was the only observatory built with the sole aim of encouraging public understanding of astronomy and furthering education. This is what makes it unique."

A council spokesman said that no decisions had been taken on the budget for next year, which is due to be set in February 2011.

However, in an e-mail sent earlier this month to Fraser Macpherson, Liberal Democrat group leader on the SNP-run council, David Dorward, the council's chief executive, said: "I refer to the meeting we had on the 1 November 2010, during which we discussed the matter you raised regarding the Mills Observatory. As I stated in the e-mail I previously sent you, the officers are examining a range of options.

"I've raised the issue with the chief executive and he has admitted that options are being discussed.

"But while I welcome the assurances he gave that ownership would remain with the council, he failed to address questions over a private trust taking it over and how it will be run in years to come.

"At the moment it gets council funding and is managed for the benefit of the whole community with no admission charge. It is well-used and provides services not just in terms of an observatory for people in Dundee but the wider region too and has built up an excellent international reputation.

"We are not averse to discussions about the future of any facility in these challenging financial times. But the worry is a private trust would only be the first step and doesn't answer questions about the Mills' long-term future or the possibility of it being sold off. What I am seeking now is an assurance about the long-term."

Courtesy: STV

Astronomy Without A Telescope – Necropanspermia

The idea that a tiny organism could hitchhike aboard a mote of space dust to cross vast stretches of space and time until it landed and took up residence on the early Earth does seem a bit implausible. More likely any such organisms would have been long dead by the time they reached Earth. But... might those long dead alien carcasses still have provided the genomic template that kick started life on Earth? Welcome to necropanspermia.

Panspermia, the theory that life originated somewhere else in the universe and was then transported to Earth requires some consideration of where that *somewhere else* might be. As far as the solar system is concerned – the most likely candidate site for the spontaneous formation of a water-solvent carbon-based replicator is... well, Earth. And, since all the planetsare of a similar age, the only obvious reason to appeal to the notion that life must have spontaneously formed somewhere else, is if a much longer time span than was available in the early solar system is required.

Opinions vary, but Earth may have offered a reasonably stable and watery environment from say 4.3 billion years until 3.8 billion years ago – which is about when the first evidence of life became apparent in the fossil record. This represents a good half billion years for the spontaneous production of some kind of primitive chemical replicator to evolve into a self-contained organism capable of metabolic energy production and comprehensive reproduction.

Half a billion years sounds like a generous amount of time – although with only one example to go by, who knows what a generous amount of time really is. Wesson (below) argues that it is not enough time – referring to other researchers who calculate that random molecular interactions over half a billion years would only produce about 194 bits of information – while a typical virus genome carries 120,000 bits – and an *E. coli* bacterial genome carries about 6 million bits.

A counter argument to this is that any level of replication in an environment with limited raw materials favours those entities that are most efficient at replication – and continues to do so generation after generation – which means it very quickly ceases to be an environment of random molecular interactions.

Nonetheless, necropanspermia offers one solution to how this process might have got started. The mechanism through which a dead alien genome usefully became the template for further organic replication on Earth is not described in detail – apart from a discussion of viruses as examples of inanimate genomic templates. While acknowledging that viruses' current mode of replication requires cellular organisms, it is proposed that this was not always the case.

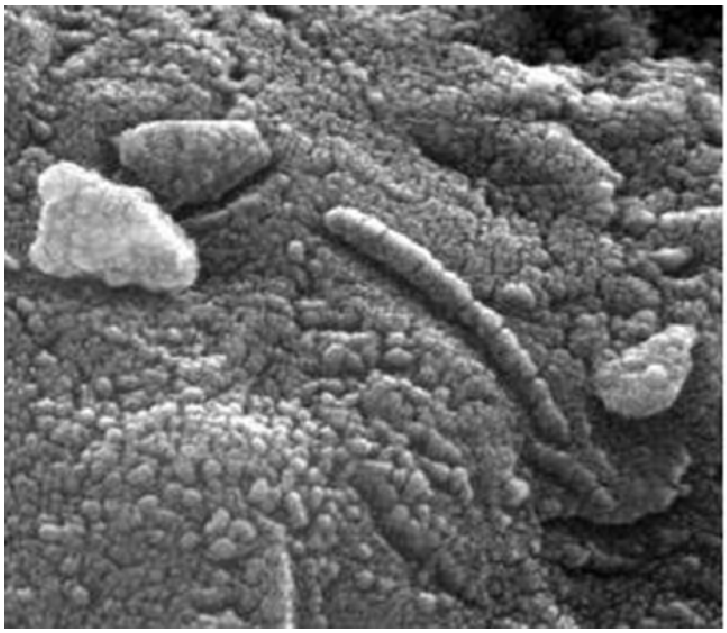
Could an alien spore really travel light years between different star systems? Well, as long as your theory doesn't require it to be alive when it arrives - sure it can.

Whether this line of thinking does much to support the necropanspermia theory remains to be seen. The theory still requires that the early Earth was ideally primed and ripe for seeding – with a gently warmed cocktail of organic compounds, shaken-but-not-stirred, beneath a protective atmosphere and a magnetosphere.

Under these circumstances, the establishment of a primeval replicator through a fortuitous conjunction of organic compounds seems quite plausible. It is not immediately clear that we need to appeal to the arrival of a dead interstellar virus to kick start the world as we know it.

Further reading: Wesson, P. Panspermia, past and present: Astrophysical and Biophysical Conditions for the Dissemination of Life in Space.

Courtesy: Universetoday.com



Search engine the term panspermia and you get (left) ALH84001, a meteorite from Mars which has some funny looking structures which may just be mineral deposits; and (right) a tardigrade - a totally terrestrial organism that can endure high levels of radiation, desiccation and near vacuum conditions - although it much prefers to live in wet moss. So, no panspermia here - just astronomy with an electron microscope. Credit: NASA

Scientists Unlock the Secrets of Exploding Plasma Clouds on the Sun

The Sun sporadically expels trillions of tons of million-degree hydrogen gas in explosions called coronal mass ejections (CMEs). Such clouds are enormous in size (spanning millions of miles) and are made up of magnetized plasma gases, so hot that hydrogen atoms are ionized. CMEs are rapidly accelerated by magnetic forces to speeds of hundreds of kilometers per second to upwards of 2,000 kilometers per second in several tens of minutes. CMEs are closely related to solar flares and, when they impinge on Earth, can trigger spectacular auroral displays. They also induce strong electric currents in Earth's plasma atmosphere (i.e., the magnetosphere and ionosphere), leading to outages in telecommunications and GPS systems and even the collapse of electric power grids if the disturbances are very severe.

Since the first observation of a solar flare in 1859, solar eruptions ("explosions") have attracted much attention from scientists around the world and have been studied with a succession of increasingly sophisticated international satellite missions in the past three decades. A major challenge has been that enormous and complicated plasma structures accelerating away from the Sun can only be observed remotely. As a result, it has been difficult to test theoretical models to establish a correct understanding of the mechanisms that cause such eruptions. But in 2006, an international twin-satellite mission called STEREO was launched to continuously observe the erupting plasma structures from the Sun to Earth.

Now, using the data from STEREO, scientists at the Naval Research Laboratory (NRL) in Washington, D.C., have demonstrated for the first time that the observed motion of erupting plasma clouds driven by magnetic forces can be correctly explained by a theoretical model.

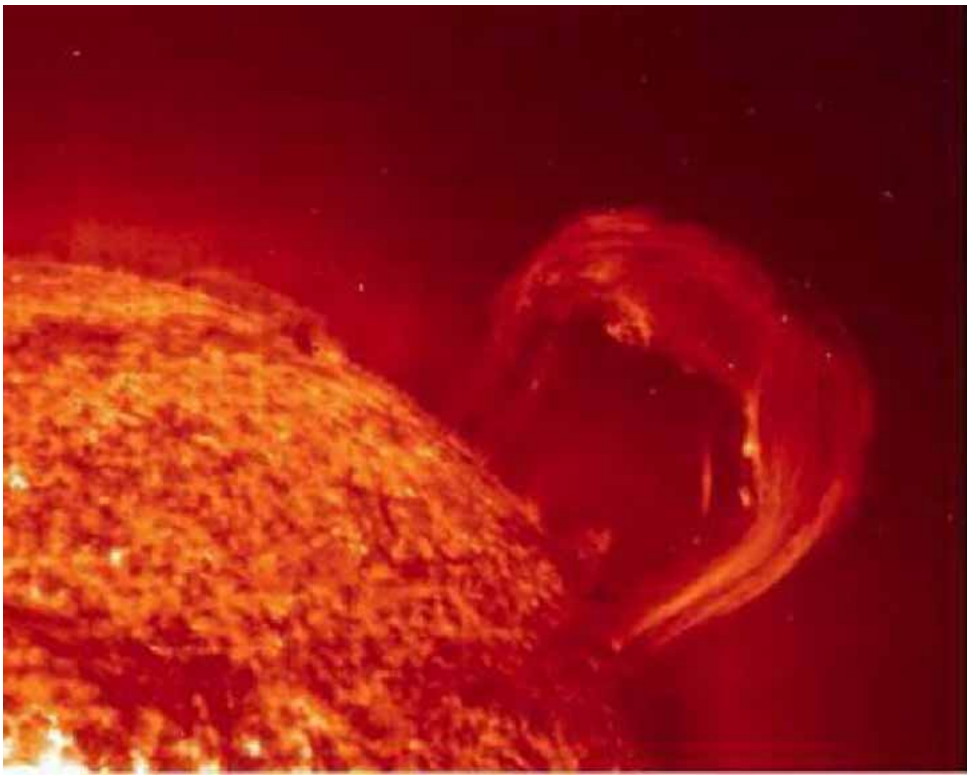
The theory, controversial when it was first proposed in 1989 by Dr. James Chen of NRL, is based on the concept that an erupting plasma cloud is a giant "magnetic flux rope," a rope of "twisted" magnetic field lines shaped like a partial donut. Chen and Valbona Kunkel, a doctoral student at George Mason University, have applied this model to the new STEREO data of CMEs and shown that the theoretical solutions agree with the measured trajectories of the ejected clouds within the entire field of view from the Sun to Earth.

The position of the leading edge (LE) of a CME that erupted on December 24, 2007 were tracked by the STEREO-A spacecraft from the earliest stages of eruption to its arrival at 1 AU approximately five days later. The magnetic field and plasma parameters were measured by the STEREO-B spacecraft. The agreement between theory and data is within 1 percent of the measured position of the LE. Chen and Kunkel's results show that the theoretically predicted magnetic field and plasma properties are in excellent agreement with the measurements aboard STEREO-B. This is the first model that can replicate directly observed quantities near the Sun and Earth as well as the actual trajectories of CMEs. Prior to STEREO, the motion of CMEs in the region corresponding to HI1 and HI2 data was not observed.

Interestingly, the basic forces acting on solar flux ropes are the same as those in laboratory plasma structures such as tokamaks developed to produce controlled fusion energy. The mechanism described by the theory is also potentially applicable to eruptions on other stars.

Researchers presented their work at the 52nd annual meeting of the American Physical Society's Division of Plasma Physics, held in Chicago Nov. 8-12.

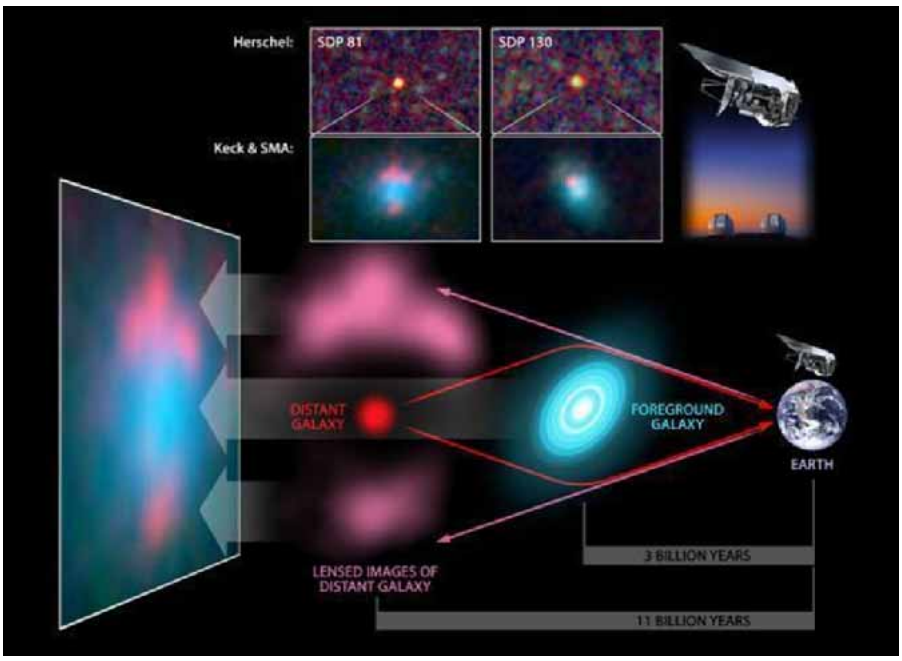
Courtesy: ScienceDaily



An erupting "prominence" is observed using photons at wavelength 304 Å. A prominence typically outlines the trailing part of a larger CME flux rope structure. The striated plasma filaments are organized by magnetic fields into strands of a "rope." In this snapshot, the apex is at about 300,000 km above the solar surface, a distance equal to about 24 Earths placed side by side. Image obtained at 07:19 UT, Sept. 14, 1999, by the EIT instrument on the SOHO spacecraft. Both SOHO and STEREO are cooperative missions between the European Space Agency (ESA) and NASA. (Credit: ESA and NASA)

Close-Up of Hidden Galaxies With New Cosmic Zoom Lenses

Astronomers have discovered a new way of locating a natural phenomenon that acts like a zoom lens and allows astronomers to peer at galaxies in the distant and early Universe. These results are from the very first data taken as part of the "Herschel-ATLAS" project, the largest imaging survey conducted so far with the European Space Agency's Herschel Space Observatory, and are published in the journal *Science*.



The magnification allows astronomers to see galaxies otherwise hidden from us when the Universe was only a few billion years old. This provides key insights into how galaxies have changed over the history of the cosmos.

Dr Loretta Dunne from the School of Physics and Astronomy at The University of Nottingham is joint-leader of the Herschel-ATLAS survey. Dr Dunne said: "What we've seen so far is just the tip of the iceberg. Wide area surveys are essential for finding these rare events and since Herschel has only covered one thirtieth of the entire Herschel-ATLAS area so far, we expect to discover hundreds of lenses once we have all the data. Once found, we can probe the early Universe on the same physical scales as we can in galaxies next door.

"The data from the area of sky used for this work has now been released to the astronomical community and we hope that now astronomers not directly involved in H-ATLAS will dive into this data set and exploit the wealth of science which is bursting to be done with it."

A century ago Albert Einstein showed that gravity can cause light to bend. The effect is normally extremely small, and it is only when light passes close to a very massive object such as a galaxy containing hundreds of billions of stars that the results become easily noticeable. When light from a very distant object passes a galaxy much closer to us, its path can be bent in such a way that the image of the distant galaxy is magnified and distorted. These alignment events are called "gravitational lenses" and many have been discovered over recent decades, mainly at visible and radio wavelengths.

As with a normal glass lens the alignment is crucial, requiring the position of the lens – in this case a galaxy – to be just right. This is very rare and astronomers have to rely on chance alignments, often involving sifting through large amounts of data from telescopes. Most methods of searching for gravitational lenses have a very poor success rate with fewer than one in 10 candidates typically being found to be real.

Herschel looks at far-infrared light, which is emitted not by stars, but by the gas and dust from which they form. Its panoramic imaging cameras have allowed astronomers to find examples of these lenses by scanning large areas of the sky in far-infrared and sub-millimetre light.

Dr Mattia Negrello, of the Open University and lead researcher of the study, said: "Our survey of the sky looks for sources of sub-millimetre light. The big breakthrough is that we have discovered that many of the brightest sources are being magnified by lenses, which means that we no longer have to rely on the rather inefficient methods of finding lenses which are used at visible and radio wavelengths."

The Herschel-ATLAS images contain thousands of galaxies, most so far away that the light has taken billions of years to reach us. Dr Negrello and his team investigated five surprisingly bright objects in this small patch of sky. Looking at the positions of these bright objects with optical telescopes on the Earth, they found galaxies that would not normally be bright at the far-infrared wavelengths observed by Herschel. This led them to suspect that the galaxies seen in visible light might be gravitational lenses magnifying much more distant galaxies seen by Herschel.

To find the true distances to the Herschel sources, Negrello and his team looked for a tell-tale signature of molecular gas. Using radio and sub-millimetre telescopes on the ground, they showed that this signature implies the galaxies are being seen as they were when the Universe was just 2-4 billion years old – less than a third of its current age. The galaxies seen by the optical telescopes are much closer, each ideally positioned to create a gravitational lens. Dr Negrello commented that "previous searches for magnified galaxies have targeted clusters of galaxies where the huge mass of the cluster makes the gravitational lensing effect unavoidable. Our results show that gravitational lensing is at work in not just a few, but in all of the distant and bright galaxies seen by Herschel."

The magnification provided by these cosmic zoom lenses allows astronomers to study much fainter galaxies, and in more detail than would otherwise be possible. They are the key to understanding how the building blocks of the Universe have changed since they were in their infancy. Professor Rob Ivison of the Royal Observatory, Edinburgh, part of the team that created the images, said "This relatively simple technique promises to unlock the secrets of how galaxies like our Milky Way formed and evolved. Not only does the lensing allow us to find them very efficiently, but it helps us peer within them to figure out how the individual pieces of the jigsaw came together, back in the mists of time."

Professor Steve Eales from Cardiff University and the other leader of the survey added: "We can also use this technique to study the lenses themselves. This is exciting because 80 per cent of the matter in the Universe is thought to be dark matter, which does not absorb, reflect or emit light and so can't be seen directly with our telescopes. With the large number of gravitational lenses that we'll get from our full survey, we'll really be able to get to grips with this hidden Universe."

The University of Nottingham has broad research portfolio but has also identified and badged 13 research priority groups, in which a concentration of expertise, collaboration and resources create significant critical mass. Key research areas at Nottingham include energy, drug discovery, global food security, biomedical imaging, advanced manufacturing, integrating global society, operations in a digital world, and science, technology & society.

Through these groups, Nottingham researchers will continue to make a major impact on global challenges.

Courtesy: ScienceDaily

CIRS Reveals Saturn Is on a Cosmic Dimmer Switch

Like a cosmic light bulb on a dimmer switch, Saturn emitted gradually less energy each year from 2005 to 2009, according to observations by NASA's Cassini spacecraft. But unlike an ordinary bulb, Saturn's southern hemisphere consistently emitted more energy than its northern one.

On top of that, energy levels changed with the seasons and differed from the last time a spacecraft visited in the early 1980s. These never-before-seen trends came from an analysis of comprehensive data from the Composite Infrared Spectrometer (CIRS), an instrument built by NASA's Goddard Space Flight Center in Greenbelt, Md., as well as a comparison with earlier data from NASA's Voyager spacecraft.

When combined with information about the energy coming to Saturn from the sun, the results could help scientists understand the nature of Saturn's internal heat source.

The findings were reported November 9 in the Journal of Geophysical Research-Planets by Liming Li of Cornell University in Ithaca, N.Y. (now at the University of Houston), and colleagues from several institutions, including Goddard and NASA's Jet Propulsion Laboratory in Pasadena Calif., which manages the Cassini mission.

"The Cassini CIRS data are very valuable because they give us a nearly complete picture of Saturn," says Li. "This is the only single data set that provides so much information about this planet, and it's the first time that anybody has been able to study the power emitted by one of the giant planets in such detail."

The planets in our solar system lose energy in the form of heat radiation in wavelengths that are invisible to the human eye. The CIRS instrument picks up wavelengths in the thermal infrared region, which is beyond red light, where the wavelengths correspond to heat emission.

"In planetary science, we tend to think of planets as losing power evenly in all directions and at a steady rate," says Li. "Now we know Saturn is not doing that." (Power is the amount of energy emitted per unit of time.)

Instead, Saturn's flow of outgoing energy was lopsided, with its southern hemisphere giving off about one-sixth more energy than the northern one, Li explains. This effect matched Saturn's seasons: during those five Earth years, it was summer in the southern hemisphere and winter in the northern one. (A season on Saturn lasts about seven Earth years.)

Like Earth, Saturn has these seasons because the planet is tilted on its axis, so one hemisphere receives more energy from the sun and experiences summer while the other receives less energy and is shrouded in winter. Saturn's equinox, when the sun was directly over the equator, occurred in August 2009.

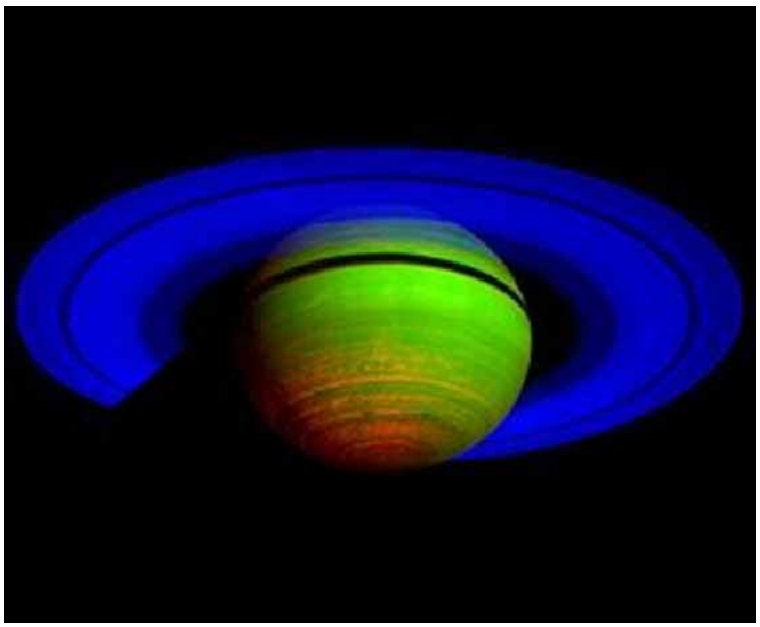
In the study, Saturn's seasons looked Earth-like in another way: in each hemisphere, its effective temperature, which characterizes its thermal emission to space, started to warm up or cool down as a change of season approached.

Because Saturn's weather is variable and the atmosphere tends to retain heat (called heat inertia), the temperature changes in complicated ways throughout the atmosphere.

"The effective temperature provides us a simple way to track the response of Saturn's atmosphere, as a system, to the seasonal changes," says Li. Cassini's observations in the northern hemisphere revealed that the effective temperature gradually dropped from 2005 to 2008 and then started to warm up again by 2009. In Saturn's southern hemisphere, the effective temperature cooled from 2005 to 2009, as the equinox started to approach.

The emitted energy for each hemisphere rose and fell along with the effective temperature. Even so, during this five-year period, the planet as a whole seemed to be slowly cooling down and emitting less energy.

To find out if similar changes were happening one Saturn year ago, the researchers looked at data collected by Voyager in 1980 and 1981.



Heat emitted from the interior of Saturn (red) shows up in this false-color image of Saturn, made from data taken in 2008 by Cassini's visual and infrared mapping spectrometer. Credit: NASA/JPL/ASI/University of Arizona.

Like Cassini CIRS, Voyager recorded fluctuations in the energy emitted by the planet and in the effective temperature. But Voyager did not see the imbalance between the southern and northern hemispheres; instead, the two regions were much more consistent with each other.

Why wouldn't Voyager have seen the same summer-versus-winter difference between the two hemispheres? The amount of energy coming from the sun (called solar radiance), which drives weather and atmospheric temperatures, could have fluctuated from one Saturn year to the next. The patterns in Saturn's cloud cover and haze could have, too.

"It's reasonable to think that the changes in Saturn's emitted power are related to cloud cover," says Amy Simon-Miller, who heads the Planetary Systems Laboratory at Goddard and is a co-author on the paper.

"As the amount of cloud cover changes, the amount of radiation escaping into space also changes. This might vary during a single season and from one Saturn year to another. But to fully understand what is happening on Saturn, we will need the other half of the picture: the amount of power being absorbed by the planet."

Li is finishing an analysis of the solar energy that came to Saturn, based on data sets collected by two other Cassini instruments, the imaging science subsystem and the visual and infrared mapping spectrometer.

He agrees that this information is crucial because Saturn, like its fellow giant planets Jupiter and Neptune, is thought to have its own source of internal energy. (The fourth giant planet, Uranus, does not seem to have an internal source.)

By studying the changes in Saturn's outgoing energy along with the changes in incoming solar energy, scientists can learn about the nature of the planet's internal energy source and whether it, too, changes over time.

"The differences between Saturn's northern and southern hemisphere and that fact that Voyager did not see the same asymmetry raise a very important question: does Saturn's internal heat vary with time?" says Li. "The answer will significantly deepen our understanding of the weather, internal structure and evolution of Saturn and the other giant planets."

Courtesy: SpaceDaily.com

Primordial Dry Ice Fuels Comet Jets

One of the biggest comet findings coming out of the amazing images and data taken by the University of Maryland-led EPOXI mission as it zipped past Comet Hartley 2 last week is that dry ice is the 'jet' fuel for this comet and perhaps many others.

Images from the flyby show spectacular jets of gas and particles bursting from many distinct spots on the surface of the comet. This is the first time images of a comet have been sharp enough to allow scientists to link jets of dust and gas with specific surface features.

Analysis of the spectral signatures of the materials coming from the jets shows primarily CO2 gas (carbon dioxide) and particles of dust and ice.

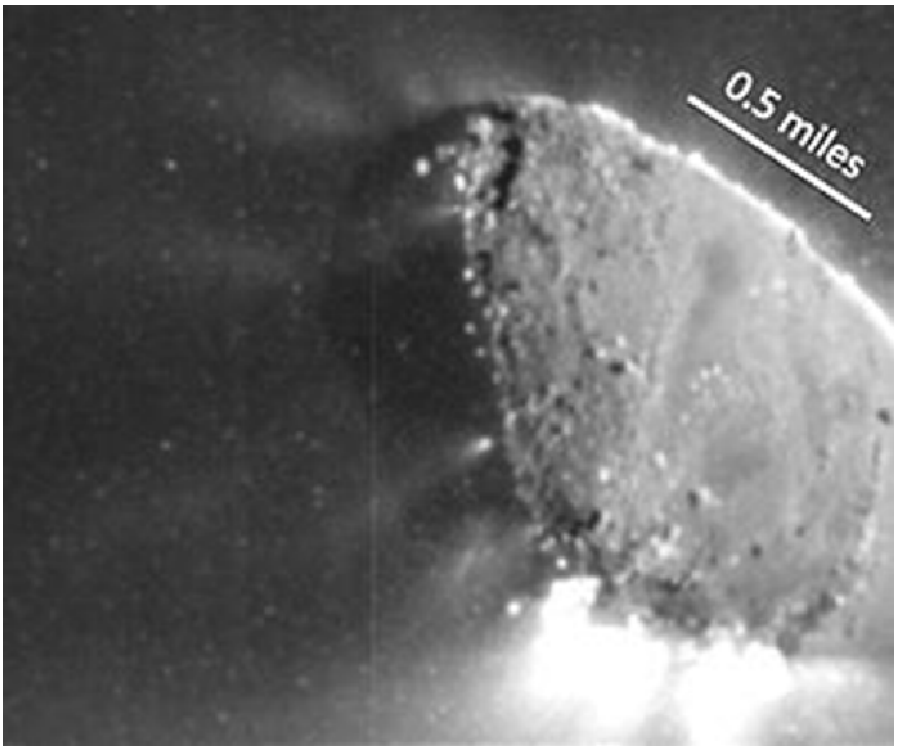
"Previously it was thought that water vapor from water ice was the propulsive force behind jets of material coming off of the body, or nucleus, of comet," said University of Maryland astronomy professor Jessica Sunshine, who is deputy principal investigator for the EPOXI mission.

"We now have unambiguous evidence that solar heating of subsurface frozen carbon dioxide (dry ice), directly to a gas, a process known as sublimation, is powering the many jets of material coming from the comet. This is a finding that only could have been made by traveling to a comet, because ground based telescopes can't detect CO2 and current space telescopes aren't tuned to look for this gas," Sunshine said.

Sunshine and other members of the EPOXI science team are meeting all this week at the University of Maryland to analyze the very large amount of data from the closest approach, and new data continues to come down at a rate of some 2,000 images a day.

The Deep Impact spacecraft that flew past Comet Hartley 2 has three instruments - two telescopes with digital color cameras and an infrared spectrometer. The spectrometer measures the absorption, emission and reflection of light (spectroscopic signature) that is unique to each molecular compound.

This allows Maryland scientists to determine the composition of the material in the jets, on the comet's surface, etc. They have found that water and carbon dioxide dominate the infrared spectrum of Comet Hartley 2's environment and that organics, including methanol, are present at lower levels.



This enhanced image, one of the closest taken of comet Hartley 2 by NASA's EPOXI mission, shows jets and where they originate from the surface. There are jets outgassing from the sunward side, the night side, and along the terminator - the line between the two sides. The image was taken by EPOXI's Medium-Resolution Instrument on Nov. 4, 2010. The sun is to the right. Credit: NASA/JPL-Caltech/UMD

This is no surprise to scientists. But what is surprising is that there is a lot more carbon dioxide escaping this comet than expected.

"The distribution of carbon dioxide and dust around the nucleus is much different than the water distribution, and that tells us that the carbon dioxide rather than water takes dust grains with it into the coma as it leaves the nucleus, said Assistant Research Scientist Lori Feaga.

"The dry ice that is producing the CO2 jets on this comet has probably been frozen inside it since the formation of the solar system."

From Deep Impact to Hartley 2

According to University of Maryland Research Scientist Tony Farnham, findings from the team's 2005 Deep Impact mission to Comet Tempel 1, though less conclusive, nonetheless indicate that the Hartley 2 findings that super-volatiles (CO2) and not water drive the activity, probably are a common characteristic of comets.

"Tempel 1 was most active before perihelion when its southern hemisphere, the hemisphere that appeared to be enhanced in CO2, was exposed to sunlight," said Farnham, a member of both the Deep Impact and EPOXI science teams. "Unlike our Hartley encounter, during the flyby with Tempel 1, we were unable to directly trace the CO2 to the surface, because the pole was in darkness during encounter."

The Maryland scientists devised the plan to reuse the Deep Impact spacecraft and travel to a second comet in order to learn more about the diversity of comets and the processes that govern them. This became the EPOXI mission on which the spacecraft has flown to Comet Hartley 2.

The spacecraft's images show that Hartley 2 has an elongated nucleus, 2 kilometers in length and 0.4 kilometer wide at the narrow neck. Hartley 2 is only the 5th cometary nucleus ever seen and exhibits similarities and differences to the bodies or nuclei of other comets.

Mission Principal Investigator and science team leader Michael A'Hearn, a University of Maryland professor of astronomy, said the mission has provided, and continues to provide, a tremendous wealth of data about Hartley 2 and the team expects to announce more science findings in the coming weeks.

Courtesy: SpaceDaily.com

Astronomers Find 'Snooker' Star System

Astronomers at The University of Warwick and the University of Sheffield have helped discover an unusual star system which looks like, and may even once have behaved like, a game of snooker.

The University of Warwick and Sheffield astronomers played a key role in an international team that used two decades of observations from many telescopes around the world. The UK astronomers helped discover this "snooker like" star system through observations and analysis of data from an astronomical camera known as ULTRACAM designed by the British researchers on the team.

They looked at a binary star system called NN Serpentis which is 1670 light years away from Earth. NN Serpentis is actually a binary star system consisting of two stars, a red dwarf and a white dwarf, which orbit each other in an incredibly close, tight orbit. By lucky chance Earth sits in the same plane as this binary star system, so we can we can see the larger red dwarf eclipse the white dwarf every 3 hours and 7 minutes.

It was already thought that there may be at least one planet orbiting these two stars. However the University Warwick and Sheffield astronomers were able to use these incredibly frequent eclipses to spot a pattern of small but significant irregularities in the orbit of stars and were able to help demonstrate that that pattern must be due to the presence and gravitational influence of two massive gas giant planets. The more massive gas giant is about 6 times the mass of Jupiter and orbits the binary star every 15.5 years, the other orbits every 7.75 years and is about 1.6 times the mass of Jupiter.

Given the overall shape of the system, and how that this star system came to exist, it was hard for the British members of the research team not to think of the game of snooker.

One of the UK researchers on the project, Professor Tom Marsh from the University of Warwick's Department of Physics, said: "The two gas giants have different masses but they may actually be roughly the same size as each other, and in fact will also be roughly the same size as the red dwarf star they orbit. If they follow the patterns we see in our own star system of gas giants with a dominant yellow or blue colours, then it's hard to escape the image of this system as being like a giant snooker frame with a red ball, two coloured balls, and dwarf white cue ball."

This star system will also have seen dramatic changes in what is relatively recent times in astronomical terms the what is now the White Dwarf "cue ball" of the system may have suffered, and caused, violent changes to its own orbit and the orbit of all the planets and stars in the system.

Professor Vik Dhillon from the University of Sheffield, said: "If these planets were born along with their parent stars they would have had to survive a dramatic event a million years ago: when the original primary star bloated itself into a red giant, causing the secondary star to plunge down into the present very tight orbit, thereby casting off most of the original mass of the primary. Planetary orbits would have seen vast disturbances. Alternatively, the planets may have formed very recently from the cast off material. Either way, in relatively recent times in astronomical terms this system will have seen a vast shock to the orbits of the stars and planets, all initiated by what is now the white dwarf at the heart of the system."

Courtesy: Sciencedaily.com