FAS Newsletter

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

Annual Convention & AGM

First of all, before reporting on another enjoyable FAS Annual Convention, it is important to announce that the 2013 Convention will be held on Saturday 19th October at the Institute of Astronomy, Madingley Road, Cambridge. More details a little nearer the time, but this heads-up will allow you to get this event into your diary early.

The Convention held in October this year went off very well, as usual, and all delegates seemed to get something from the event. Thanks must be extended to those who put so much effort into the event, in particular to Steve Williams for organising both the speakers and he exhibitors.

In recent years we have taken steps to have a speaker in reserve in case of unforeseen problems. This however proved to be somewhat inadequate in that Mike Frost had to withdraw a short time before the event and Dr Johanna Jarvis kindly agreed to give a talk. Then a family illness meant that, at the last minute, Robin Leadbetter would be unable to get to Cambridge. Fortunately, Andy Green, who was attending the Convention agreed to step in. Many thanks to Johanna and Andy.

The programme kicked off with Professor Carole Mundell regaling us about 'Big Bangs and Black Holes', where she talked about using a robotic telescope on La Palma to track and classify Gamma Ray Bursts.

The second talk, taking us to lunch was given byProfessor Paul Hewett who explained about 'Finding the Highest Redshift Quasar' and the relationship between the size of the quasar and the galaxy it emanates from.

After spending the lunch period drinking tea, munching bicuits and drooling over goodies on the trade stands, the next talk was 'Twinkle, Twinkle Little Star' by Dr Johanna Jarvis, where she described how the action of star formation and supernovae formed the various elements we find in the periodic table.

At the AGM of the FAS, which followed Dr Jarvis's talk, Richard Sargent took the meeting through the events, actions and decisions of the FAS and at the conclusion "handed over the President's baton" to Gary Gawthrope for the coming year.

The penultimate talk was given by Andy Green, who valiantly stepped in at the last minute. This talk entitled 'Cosmic Collisions'

(Continued on page 3)

Richard Sargent opening the 2012 Convention

Farewell Sir Patrick

Picture: Getty Images

The phrase 'we shall never see his like again' is an oft used but never has it been more appropriate.

The sad passing of the inspiration to virtually every amateur, and probably most professional, astronomers was announced on Sunday 9th December, at the age of 89. His friend, Brian May, astrophysicist and erstwhile guitarist with Queen said "the world has lost a priceless treasure that can never be replaced" - sentiments echoed by luminaries and ordinary people alike.

As a setter of records, Patrick was unsurpassed. His Sky at Night programme, which was only due to run for a handful of episodes, ran for 55 years and he only missed presenting one edition in all the time from its start in 1957.

He wrote over 70 or so astronomy books and I doubt that there is an astronomer who has none of his books on his or her shelf. Even my rather modest collection contains 20 volumes.

Patrick was oft described as an eccentric, a phrase which he seemed to subscribe to, but which in my opinion was really a term of endearment. The fact that he was often to be seen sending himself up . Performances with Morecombe and Wise, The Goodies and many others are a testament to his great sense of humour.

Whilst astronomy was his main interest, he was a talented musician, playing the xylophone at a Royal Command performance and an enthusiastic sportsman in his younger days - turning out for Selsey Cricket Club well into his seventies.

Getting back to astronomy, though, apart from his books and television programmes, Patrick's lasting legacy is in the listing of celestial objects known as The Caldwell Catalogue (Caldwell was his middle name) and the asteroid 2602 Moore.

Whilst I am sad I never met him personally, he always came across as though he were a personal friend. He'll be sadly missed.

Let us hope the BBC will keep his memory alive by continuing Sky at Night well into the distant future.

Frank Johns

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President's Spot

I'll start my first Presidents report by thanking Richard Sargent for all his efforts as President over the past few years, he's now carrying out my old role as Vice President. I'd also like to thank Steve Williams for the time he spent on the FAS Council as Publications Distribution Officer and as a Regional Representative of the Chilterns Group and wish him every success for the future. The Publications Distribution has been taken over by Adrian Roach from Kernow Astronomers, who is conveniently located quite close to the printer we use.

I would like to thank all speakers, traders and visitors for making the October convention another successful event. Special thanks goes to Brian Lister and Cambridge AS for helping out on the day and for keeping us all refreshed with teas, coffees and biscuits. We can announce that the Institute of Astronomy at Cambridge with be the venue of the 2013 convention on 19th October.

I hope all societies managed to have successful Dark Sky Discovery events between 22nd October and 4th November 2012. The FAS distributed grants from DSD (supplemented with FAS funding) to the value of approximately £2400 to member societies to help run these events. To the 24 societies who received grants please remember to submit your feedback to DSD and please copy the FAS in your response (grants@fedastro.org.uk). To the other 164 societies please consider applying for funding to run events when it becomes available, I'm sure some of you must have run DSD events and funding can help with venue hire, publication materials, etc.

I know its early but National Astronomy Week 2014 has been announced with 'Target Jupiter' as the theme. NAW 2014 runs from 1st to 8th March 2014 when Jupiter will be in prime position for astronomers and the public in general to observe and image it. For those societies wanting grants or external funding to help put on these events then start thinking about it now, check with prospective funding bodies what their cut off dates are for submission & get applications sent in with plenty of time.

It was decided at the December 2012 council meeting that the minutes of previous council meetings (starting with the December 2012 minutes) will be made available in the members' area of the website after they have been approved at the following council meeting.

The FAS telescope project has received interest from approximately 48 societies and we are now looking towards setting up a user/management group to help take this forward.

As you read this, BBC Stargazing Live programmes will have aired and hopefully you are reaping the benefits from all this. The free advertising that comes along with the programmes should help societies with both increased visitor numbers at their events and people wanting to become members, that's a win-win in my book.

That's enough from me for this time.

Gary Gawthrope

LATEST NEWS ON FAST

The FAS Council decided at its meeting on 7th December to press on with the FAS Telescope project. Since our last briefing, we have been exploring and digging deeper into the operational detail of the proposal. We have been able to draw on expertise within the Council, the experience of other colleagues and on the many valuable suggestions and insights that FAS societies provided when responding to the original proposal and since.

Key areas for decision include scheduling and time allocation, equipment choices, fee structure, training, the management of the facility … I could go on. Suffice to say that making the right decisions in these and related areas will determine the ultimate viability of the project and the value and satisfaction that user societies get out of it.

At the same time, we shall need to design a system that promotes fairness in terms of opportunity and access and, as far as possible, meets the needs of a wide range of users, including beginners and advanced practitioners. We shall need, for example, to balance the effects of Moon phase, season and night length and to determine such practical basics as slot length and handover time. In turn, this invokes technical considerations relating to, among other things, exposure times, pointing speed and accuracy etc.

The good news about scheduling is that the number of theoretically available observing hours at the site is much greater than originally proposed: around 3,000, in fact, calculated from evening end to dawn commencement of astronomical twilight. This gives us some useful options. For one thing, we should be able to make a relatively generous basic allocation to participating societies while retaining a good deal of overall flexibility. We shall need this flexibility for maintenance and other unavoidable time-outs, but we might also use it constructively to respond to societies' differing needs and preferences. Beyond the basic allocations and maintenance time, we might also nominate slots for image requests or to allow, as several societies suggested in their early responses, the option of purchasing extra time.

Providing for a range of users presents a conundrum all too familiar to astronomers and imagers for, as we know, no single telescope/camera combination is best for all applications or targets. The debate is a fascinating one, liable to increase the sales of slowly savoured old malt, but, of course, there is no 'right' answer!

Reports from expert users of the Astrocamp site (www.astrocamp.es) - which is at altitude and subject to extremes of temperature and weather – repeatedly emphasise the need for maximum possible robustness in all aspects of the imaging system. This is always a desirable thing, of course, but especially so in a remote and challenging location where the kind of tweaks and adjustments you might carry out routinely in your backyard observatory will not be possible.

We have now reached the point in the project where we can start to move towards some definite decisions about how it will run and be managed. To help ensure that the project develops in a way that reflects the needs of user societies, the FAS Council would like to propose the formation of a FAST Project Group to include several FAS Council members and several potential users from FAS member societies. The group would number 6 to 8 and, after an initial meeting would conduct its business primarily by email. If FAST gets off the ground, we shall also need a beta-testing group. Once it is fully operational, management arrangements will need to be put in place and, again, we feel that representatives from user societies should be integral to these.

If you feel that you have the experience to contribute, in the first instance, to the work of the Project Group and would like to be involved, please contact me by email at fast@fedastro.org.uk with details of your relevant experience and expertise. Substantial experience with imaging and the issues around it would be essential and experience with remote working especially useful.

John Evans
Council Member FAS

(Continued from page 1)

covered all manner of violent impacts both terrestrial and celestial. These impacts ranged from meteorites crashing into the Earth to the colliding of galaxies. A talk full of excellent illustrations.

The FAS Council had decided that the 2012 recipient of the Eric Zucker Award would be Dr Paul Murdin. This proved to be very convenient in that Paul was due to give the final talk of the day. A bit of judicial planning, in that if an award is to be given on a surprise basis, then one has to have some ruse to ensure the recipient is present - and general speakers generally do turn up.

Paul Murdin's talk concentrated on art generally and its place in astronomical depictions. He exampled terrestrial landscape art with that of artistic impressions of other planets, etc. Paul described the investigative processes used by astronomers, such as radar imaging and explained how the artist would interpret the recorded data in order to produce a final image of what that place might look like.

42 societies were represented amongst the 140 or so delegates attending the 2012 Convention.

Glynn Bennallick from Kernow Astronomers with Sir Fred Hoyle

'almost' Past-President Richard Sargent presenting the Eric Zucker award to Dr Paul Murdin

NOTICES

Annual BAA Deep Sky Section Meeting

2nd March 2013, at Shurdington Social Centre, near Cheltenham, hosted by the Cotswold Astronomical Society.
Talks lined up are:

- Barnard, Gordon and the Darkness - Nick Hewitt,
- Deep Sky Imaging & Processing Using a Modified DSLR - Paul Curtis,
- RR Tau and Nebula Project - Gary Poyner,
- Eye and Pencil - Martin Lewis,
- Deep Sky Imaging on the Cheap - Grant Privett,
- Cosmic Telescopes - Dr. Phil Marshall, Department of Physics (Astrophysics), University of Oxford.

Everyone welcome. Entrance £10 (to include buffet lunch) payable at the door.
No need to book in advance.

Full details on the BAA and Cotswold AS websites:
britastro.org/dss cotswoldas.org.uk

"Ireland: The Final Frontier"

Galway Astronomy Club invites you to our 10th annual Starparty in Galway on February 2nd 2013.

"Ireland: The Final Frontier" is the theme for the 10th annual Galway Astronomy Festival which takes place on February 2nd at the Westwood House Hotel on the western suburbs of Galway City. This year our emphasis is on Irish Academic and Amateur astronomers who are involved in cutting edge scientific research from that range from powerful space telescopes to backyard observatories, but all gaining equally impressive results. Also in this years program is a remembrance talk to the late and great Sir Patrick Moore who died very recently. For this we have put together seven interesting lectures that will be spaced over the day, along a workshop and trade stands and the usual visit for new attendees to the robotic NUI Galway Observatory, to cap off the evening the usual top class dinner of the Westwood Hotel followed by our closing talk. .

Launch by Professor Michael Redfern

Morning Session

- Dr. Andrew Shearer (President of the Centre for Astronomy, NUI Galway): "Kepler - The Search for Habitable Planets"
- John Flannery: (South Dublin AS) "What makes a Great Comet?"
- Dave Gradwell: "OSCAR: A Unique Irish Solar Observatory" www.surfingthesun.com

Optional Lunchtime Workshop:

- Ronan Newman: (Galway Astronomy Club) "Celestial Light: Catching the elusive Aurora Borealis from Ireland" www.facebook.com/CelestialLightIrishAuroraHuntersHomepage

Afternoon Session

- Prof. Tom Ray: (Dublin Institute of Advanced Studies) "Making Stars and Planets: The First Three Billion Years"
- Dave Grennan: "Hunting Extra-Galactic Supernovae from Ireland" www.webtreatz.com
- Professor Lorraine O'Hanlon (UCD): "The Gloria Project: The Future of Virtual E-science Telescopes" gloria-project.eu/en

After Dinner Talk

- Terry Moseley (IAA): Untold Stories of Sir Patrick Moore FRAS

Entry only €20

Hope to see you there, full information along with details of our very busy club schedule is available at www.galwayastronomyclub.ie

Please note!

Brannel Astronomy, based in Cornwall, has changed its name to:

Kernow Astronomers

Ambassadors for Astronomy

Communicating astronomy is a passion of mine, and to this end I look after the astronomy outreach done by Guildford AS for local schools, Scouts, Guides etc. Communicating Astronomy was also the title of an excellent conference mounted in October 2011 by Newbury AS. This was part of their 30th anniversary celebrations and was held in conjunction with the Science & Technology Facilities Council in the splendid setting of the Rutherford Appleton Laboratory.

One of the speakers was Jo Lewis, who looks after Education and Public Outreach at Rutherford, and is also South East Co-ordinator for Dark Sky Discovery. In her talk she introduced the audience to STEMNET and said that one of the best ways for amateur astronomers to promote interest in astronomy in schools was to become a STEM Ambassador.

So what is STEMNET? The acronym stands for **S**cience, **T**echnology, **E**ngineering and Maths. The organisation was set up to support the government's Plan for Growth as defined by BIS, the Department for Business, Innovation and Skills. The organisation's vision is commendable and the strapline on their website states "STEMNET creates opportunities to inspire young people in Science, Technology, Engineering and Mathematics". This is very compatible with our own hobby, astronomy most certainly does indeed inspire, and can lead youngsters into so many different sciences – astrophysics, geology, biology, chemistry and so many more.

Soon after this event I decided to enquire a little further, and found that applying to become a STEM Ambassador was very easy. Their website (www.stemnet.org.uk) leads you through the process quite nicely. One big plus for the scheme is that a free CRB check is included within the process of accrediting the applicant as a STEM Ambassador. As many societies will know, safeguarding is of prime importance these days, and I know that the legal issues surrounding this have unfortunately put off some otherwise keen astronomers from volunteering for outreach work. This scheme helps cut right through that confusion. For many mainstream STEM Ambassadors the role will be to go into schools to perhaps talk about their industry or business, give careers advice, explain which subjects are needed for various professions etc. The STEMNET literature states:

Activities that you can take part in as a STEM Ambassador include:

- Providing careers advice from your own personal experience
- Delivering a hands on activity
- A talk about what you and your company do
- Giving a subject talk (IE how I use maths, physics, biology, chemistry, etc., in my job)
- Demonstration to students
- Judging a challenge or competition
- Supporting a STEM Club activity
- Site Visit
- Mock Interviews

To support this there is an induction meeting, training given as and when required, resources made available – and above all, that so-important CRB check. You also get a STEM Ambassador badge and certificate, which you can show when going to a school.

If your own working life relates to some STEM disciplines, then so much the better. My professional background was as a lecturer/consultant in Systems Analysis and Business Analysis, so was not quite so relevant. However, being an Ambassador has opened up opportunities for me to go into schools to talk to the youngsters about astronomy. Mostly this is at primary school level, and at that age their big interests are either dinosaurs or space, so they are always motivated and attentive. The visit usually involves a talk plus an observing session. This can be with either a small refractor fitted with Baader film and/or my Coronado PST for H-alpha viewing. It can also mean an evening visit for a night sky observing session – the youngsters then accompanied by a parent.

Schools send in requests for a visit to their local STEMNET organisers, which for my area is the University of Reading, who in turn send out regular lists of visit request details together with school contact details. I was quite taken aback when I recently found that I was the one and only astronomer on the books for my local area which covers the whole of Surrey, East and South Berkshire. That area in turn covers six, perhaps seven FAS member societies, comprising over 400 individuals. And yet I am the only one? This tells me that not enough people out there are aware of STEMNET and the opportunities it provides, hence this article. Wherever you are in the country, if you are keen on outreach and in introducing our fascinating subject to youngsters, then please have a look at the STEMNET website, find your local area organisers, and make an application. I assure you that you will find it rewarding and you will definitely have a sense of achievement. Who knows, amongst that class you've just visited could be the first person to land on Mars! To purloin that wonderful phrase from the Olympics:

Inspire a Generation

John Axtell FRAS
Membership Secretary FAS

King's Lynn & District AS visit the MRAO

Earlier this year in June, King's Lynn & District AS visited the Mullard Radio Astronomy Observatory based at Lords Bridge Railway Station on the South West of Cambridge.

The visit was arranged through Dr Samuel George, Out Reach Officer for the MRAO based at the Cavendish Laboratory in Cambridge.

The Cavendish Laboratory operates the Observatory with support from the Particle Physics & Astronomy Research Council.

During an extensive visit of the site, the group were treated to examine all the operational and the now out of service radio telescopes and were given an informative talk on the history of the "Mullard" Site.

On a beautiful sunny day, we saw the many telescope arrays which are scattered over this large site and is easy to see why Lords Bridge was selected.

We explored and marvelled at, what was then the cutting edge of astronomy, Telescope arrays.

From the early years - the 4C array, which was the first array on the site and was used to make the 4C catalogue in 1958, to the modern Arcminute Microkelvin Imager Large Array which was built in 2007. This was formally known as the Ryle Array when in 2004 three more Telescopes were added to the original 5 Telescopes.

Still in its original position, the Interplanetary Scintillation Array - which discovered the first Pulsar, now lying victim to the ravages of time.

Although unfortunately, some of our members could not come with us due to other commitments, hopefully theywill be able come with us when we next visit.

Our thanks go to The Cavendish Laboratory for organising the visit and this really is a 'must see' for any Society.

"The Gangs all here !"
Dr Samuel George (Far Left) with members of the King's Lynn & District Astronomy

LETTERS

Dear Editor
I would appreciate it if you would publish the submission Breckland AS have made regarding the proposed development of the Sizewell C Power Station.
We feel the more publicity this gets the better the need for dark sky protection may be recognized.

Tony Fox Carter

SIZEWELL C DEVELOPMENT

Copy of Submission to EDF Energy Consultation.

As a Society we have no objection to the development of Sizewell C. We do, however have some concerns about the development stage, particularly light pollution, which adversely affects Astronomers. We would ask that the supporting infrastructure is undertaken in such a way as to minimize environmental disturbance. This would enhance EDF's green credentials and also have the benefit of limiting the upset in the area including the Nature Reserves, those who use them and the Suffolk countryside in general.

Our specific concerns are:- **Park and Ride Options 2 and 3, and Distribution Depots**

Both Options 2 and 3 are close to Haw Wood Caravan Park with Option 3 being less than half a mile away.

Haw Wood is currently one of the darkest astronomical sites in England and SQM(Sky Quality Meter) readings of 21.75, which is a measure of sky darkness, have been recorded.

Haw Wood is used by Breckland Astronomy Society to stage twice yearly, week long, Star Parties attended by astronomers from far and wide. Members of the general public are also welcomed at these events to enjoy the delights of looking at the night sky. Haw Wood also has several resident astronomers, who use the site throughout the year.

Sites as dark as Haw Wood are rare and need to be protected. Any Park and Ride site or distribution depot should therefore be as far away from Haw Wood as possible, preferably at least two miles.

Lighting should not be allowed to beam above horizontal, or be less, ideally 70 degrees and using flat glass units. Lighting should also be turned off when not needed.

There are revised BS specifications for these types of lights to be used in the region of observatories. Planning and lighting engineers should be well aware of these revised standards.
All construction materials should be brought in by sea or rail, not on already over-crowded roads.

The commuting of workers should be minimized by providing accommodation in the immediate locality of the site and by utilising the improved rail access.

Additionally any lighting installed on roads in the locality should be of the same standard, as should the lighting on the site of Sizewell C itself and any temporary sites, such as distribution depots and residential areas.

Tony Fox Carter - Chair **Breckland Astronomical Society**

Dear Editor.
There seems to be anecdotal consensus among amateur astronomers who I have met, that the electronics built into some GoTo integrated telescope & mount units and some handsets are of doubtful quality and don't last long. In a telescope scope costing thousands, this is not good enough.
If readers would care to send me the answers to the following questions, plus any relevant comments I would be able to give a report of my analysis in a future Newsletter.

A STUDY INTO THE LONGEVITY AND RELIABILITY OF INTEGRATED GOTO TELESCOPE & MOUNT ASSEMBLIES AND THEIR HAND HELD CONTROLLERS.

This study is not concerned with telescope assemblies put together by people who buy OTAs and Mounts, etc., separately.

1. The name of your Society.
2. Does your Society or any of your members own integrated GoTo telescopes ?
3. If yes, what Makes & Models ?
4. When were they purchased ?
5. Do they still work ?
6. If not what is wrong with them ?
7. If you have had telescope assemblies or hand held controllers which have failed, have you had them repaired, and at what cost ?

Please add any other relevant comments.

Send to Martin Whillock at nitram82@whillock.me.uk
Thank you.

Dear FAS members,

The Met Office is about to drastically change its Weather Satellite maps, which will make them pretty useless for predicting observing conditions more than about 3hrs in advance. They are bringing in a new 'Whizzy Gizzy' set of maps with an increased time resolution of 15 minutes BUT they only show 3 hours of previous history.
For determining the likelihood of observing on any given night, more than 3 hours in advance, astronomers need both the 24hrs of history:
http://www.metoffice.gov.uk/satpics/latest_uk_vis.html
and the higher resolution images:
http://www.metoffice.gov.uk/public/weather/observations/?tab=map&map=SatelliteVis.

MKAS has now requested that the Met Office provide an option to include up to 24 hrs of historical maps on their new website but they don't appear to want to know, they just keep coming up with reasons for not providing this functionality. We have emailed on several occasions but the Met Office refuse to budge on this issue. They say that it would require a lot of programming effort to do this and they have to provide a service for the majority of their customers.
The running of the Met Office website is overseen by the Public Weather Service Customer Group (PWSCG) which is supposed to make sure that the MetOffice offers the best possible service to ALL stakeholders including astronomers!

BOOK REVIEW

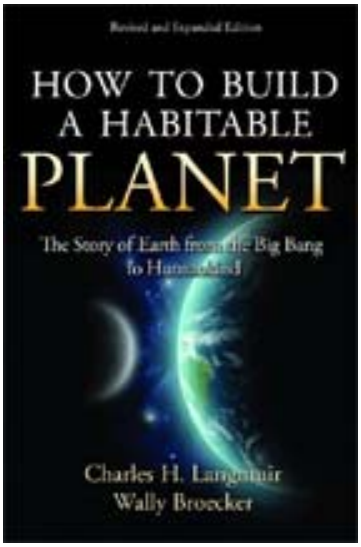
HOW TO BUILD A HABITABLE PLANET

Charles H. Langmuir and Wally Broecker

Princeton University Press. ISBN 978-0-691-14006-3 £27.95

On page 665 of this, 21 chapter - 718 page volume, near the conclusion of a detailed discussion of the possibilities of extra-terrestrial life and of other technological civilisations, there is a telling sentence - 'We will ultimately be rescued from our guesses and biases by facts.' This weighty volume sets the stage for a critical appreciation of this 'rescue mission' by presenting a detailed account of the formation and evolution of the only inhabited planet yet to be subjected to detailed scientific investigation – planet Earth. As such the book is hardly, or at least not primarily, about astronomy. Against the background of recent discoveries of 'actual' rocky exoplanets however, this work provides the amateur astronomer, together with experts in otherwise unrelated scientific pursuits, with a well crafted and informative reference to the geoscience which guides the exoplanet hunters, gatherers and investigators.

The book is a rewrite and thorough update of an earlier edition by one of the authors (Broeker) published in 1984 and of the same title. The intervening twenty eight years have seen such major advances in geoscience that this new volume is both timely and necessary and it covers in detail those advances, discoveries and on-going investigations which underpin so much of twenty first century interest in the subject matter. The emergence of life, the rise of oxygen, the 'Snowball Earth' hypothesis, geothermal vents, the Antarctic ice core, global warming and exoplanet studies are all new to this revision. Topics such as short lived radionuclides and isochron dating techniques are again dealt with in detail. The book is a textbook and is used as an accompanying volume to a series of lectures given at Harvard for the past six years. The authors point to the experience of building, supervising and developing this course in guiding the revision process. The subject matter is thoroughly interdisciplinary and there is much chemistry, biology, geology and yes, some astrophysics through which the reader must wade. The authors are uncompromising in their use of scientific terminology and language but the material is dealt with in a helpful and accessible manner with well-annotated diagrams and graphs. At the end of each of the twenty one chapters there is a useful summary which makes it possible to 'dip in' and to refer back to any topic. The book is certainly useable therefore as a reference text. It also comes with a comprehensive glossary and a detailed index.



This story of Earth from Big Bang to Humankind will appeal to a wide scientific readership. The amateur astronomer will perhaps be drawn initially to the earlier chapters, which deal with aspects of big bang cosmology, stellar nucleosynthesis, the formation and evolution of galactic, stellar and planetary structures, with Earth's emergence from the solar nebula and its early violent history. There is a detailed discussion of the important contribution to our understanding of early Earth from studies of chondritic meteorites. The authors progress to a discussion of the emergence of structural geology and geochemistry within the planet (core, mantle and crust), the formation and evolution of ocean and atmosphere, the emergence of life, biological evolution and the role of extinctions. The amateur astronomer will also doubtless be drawn to the discussions in later chapters of global warming, the rapid emergence and development of technology, the likely lifetime of civilisations on Earth-like planets and so to exoplanet studies in terms of the search for extraterrestrial life and for other organised technological civilisations. The progression between these varied stages of habitable planetary evolution is nonetheless smooth and the reader will be drawn back to read some chapters in greater detail perhaps than at the first attempt. Any book of this length and coverage is likely to be read and reread in chunks and different readers will initially thumb through different chapters looking for their own particular favourite and familiar topics. Throughout this process there will be numerous opportunities to question, reappraise and perhaps revise some of those often repeated 'guesses and long held biases'. In this new edition of 'How to Build a Habitable Planet' Langmuir and Brueker provide the facts on which we can sensibly base that reappraisal. That has to be a signpost to both a good read and a valuable reference text.

Brian Parsons

Nicolas-Louis De La Caille, Astronomer and Geodesist

by Ian Stewart Glass Oxford University Press. 978-0-19-966840-3 £35.00

Having read this very interesting biography I have to admit that I had never heard of Nicolas -Louis De La Caille. Furthermore checking with a number of fellow society members, I was not alone in this ignorance. However, knowing that, did not ease my being uncomfortable at being unaware of the efforts and successes of Nicolas -Louis in advancing the knowledge of our science.

Typical of many curious and talented young people N-L started of studying theology, but when his father died the family were fairly destitute and he was fortunate to have his talent spotted by Duc de Bourbon, who sponsored his further education, where he developed a deep interest in mathematics.

Having been rather disillusioned by the attitudes of the establishment he decided against becoming a priest but instead took deacon's orders, which meant he could continue with his science education.

After graduating he so impressed Cassini II that he was invited into the Cassini household, partly to continue science but also to be a good influence on the son of |Cassini II.

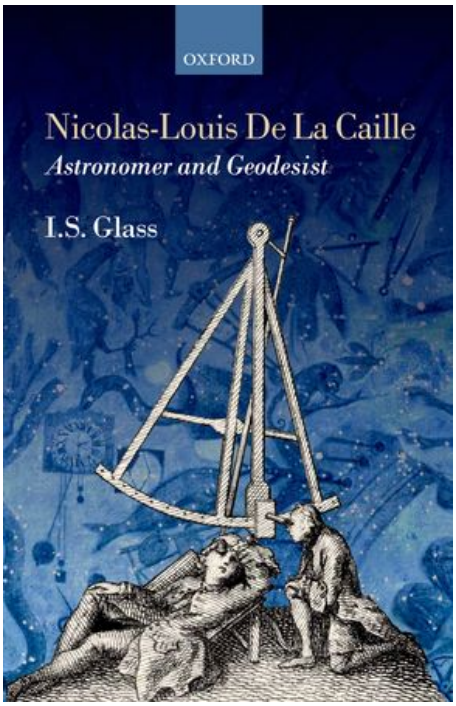
His first year was spent measuring the speed of sound, his result was 173 toise/sec (1 toise being equivalent to the British fathom).

N-L moved in a small circle of forward thinking young scientists and was a great follower of Newton's Theory of Universal Gravity. This at a time when things English were not held in high regard in France (nothing changes, does it?)

The French - Cassini I & II - believed that the Earth was not spherical but extended towards the poles, whereas Newton's Theory said it was flattened at the poles. Subsequent work proved Newton to be correct. N-L was then given the task to survey the Paris Meridien to confirm or otherwise the previous work of Cassini II. His success with this led N-L to his being made Professor of Mathematics at College Mazarin, which in turn led him to undertake his expedition to South Africa to make details observations and measurements.

His main instrument for measuring star transits, etc., is shown in the engraving on the book cover. When it is realised that the telescope is all of half-inch diameter, the difficulties become more apparent. That coupled with the fact that South Africa was very much a frontier place, his scientific recording must be considered remarkable.

The author, Ian Glass, from South African Astronomical Observatory, draws an interesting and very readable portrait of N-L, his works and legacy. A good and informative (if not cheap) read.



Frank Johns

Out of this world - at Carnewas

A great show that was out of this world was staged at Carnewas National Trust car park on the evening of Saturday 20th October 2012.

The stars appearing at the show were ...well, literally The Stars! Early in the evening the biggest star on show was the nearest one to us; our own Sun.

Then close behind came the Moon. Finally, later in the evening there was the appearance of the star spangled sky. Special guest "stars" included the International Space Station, several spectacular shooting stars and the huge planet, Jupiter.

Observing the Sun through a special solarscope showing sunspots and solar flares.

Brannel Astronomy, the local mid Cornwall astronomy club who meet every couple of weeks at St Columb Major Academy, had set up their telescopes and binoculars and a rolling slide show of spectacular astronomical photos taken by members.

The beautiful stargazing site and marquee were kindly donated for the evening by The National Trust, whose staff were so helpful in making this a success.

The clouds moved out of the way and almost a hundred people from as far afield as Liverpool and London turned up to look at the Universe that little bit closer and were not disappointed.

Some visitors brought their own binoculars and even took close up pictures of the Moon's surface with their digital cameras through the telescope eyepieces. Members of Brannel Astronomy were on hand to answer any questions and guide people around the amazing crystal clear Cornish sky.

The Moon in close up with spectacular rugged craters, mountains and lava plains. The shadowed half of the Moon could also be seen with the reflected light from our own Earth or "Earthshine".

Along with the thousands of individual stars we could see just with our eyes were the Milky Way, our own galaxy stretching across the sky, and our neighbour the Andromeda Galaxy. Visitors were shown the brighter stars making up the constellations such as the Swan, Cassiopeia and the Great Bear with exotic names like Arcturus, Elektra and Deneb and beautiful star clusters like the Pleiades.

But the night sky can surprise us. For a few minutes a party of two Americans, three Russians and one Japanese person joined our star party. They were the crew of the huge bright International Space Station that rose over the sea travelling at 17,000 miles an hour and some 250 miles high. Ninety minutes later they joined us again after having travelled once around the world.

We were also given a spectacular display of several meteors or shooting stars, the best of which was a bright fireball that travelled horizontally leaving a long orangey trail that gradually faded away.

The end of the evening saw the rising in the east of the huge King of the Planets, Jupiter with its four orbiting giant moons stretched out in a line.

A spectacular evening from a spectacular place.

Brannel Astronomy would like to thank Dark Sky Discovery and the FAS for providing a grant towards the staging of this event.

Glynn Bennallick

The following was put onto a National Trust blog, following the event:

A sky full of stars...*Posted on 20 Oct '12 by nationaltrustranger*

Last night (20th October) at Carnewas near Bedruthan Steps the sky was amazing! The local Brannel Astronomy group came along with their telescopes and expertise to give everyone a chance to look at the sun, the moon and the stars. It was incredible to see the sun through a telescope and the craters on the moon.

We saw thousands and thousands of stars, with no cloud in the way to stop us looking in awe at the Milky Way and many constellations. We also saw the International Space Station – twice! It orbits the earth in just 90minutes, travelling at over 17,000 mph – now that's fast! The International Space Station can be seen with the naked eye as it is only 200 miles above us..... It has no lights so we only see it when the sun is shining on it. We also saw an amazing shooting star, it was really noticeable, not just the usual blink and you missed it shooting star – although we did see a few of those too.

It really was incredible and so fantastic to have people there to explain to those of us that don't really know one star or constellation from another. Thanks to Brannel Astronomy and the weather – it really was an enlightening and starry evening.

Sarah Stevens, Ranger, North Cornwall – Tintagel to Holywell

If you want to know more about The National Trust log on to www.nationaltrust.org.uk

Benitachell star party by *Costa Blanca Astronomical Society*

Astronomy seems to have been the favoured activity this year on the Costa Blanca, with events being organised throughout the summer. There was a public observing event at a local park, a meteor watch on the beach and a star party located at a small village in the hills called Benitachell.


The crowds registering

The star party was an event organised by the Spanish newspaper 'Las Provincias'. They handled all the organisation and publicity and they asked the local Spanish Astronomy group and our group to handle the astronomy part. They had arranged to have 2 portable planetarium domes available showing tours of the sky for children and adults. We displayed the images of the solar system, that we had used for previous exhibitions, in the


Night Viewing

gym, and various DVDs about the solar system were played in an outdoor cinema in the playground. The two Astronomy groups were available to answer people's questions and generally chat about Astronomy and we brought telescopes to view the setting sun and later in the evening to view the sky.


Night viewing - the team


Picture show

The organisers had asked people to register beforehand to receive free Cocas (small pizza like local delicacies) and grapes and they had 450 people registered, a phenomenal turnout. The local Police turned out to help with the traffic and organisation.

The evening went very well although there were clouds around and we didn't get to see much of the setting sun. The observing took place at a different local school away from the town and we had about 8 telescopes available. The people were


Viewing pictures of the solar system

transported up in buses from the original location, so we had several waves descending at ½ hourly intervals.

The skies were again disappointing and we had to try to chase the stars that peeped out every now and again. The people were still very interested in the telescopes and asked questions about astronomy in general, so they didn't seem to mind that the skies weren't perfect.


Using a solarscope

The local council were so impressed, that they want to make it an annual event. Thanks go to Las Provincias for some of the pictures.

For more information about the Costa Blanca Astronomical society checkout our website at http://costablancaastronomers.wordpress.com/ or send us an e-mail at cbastronomy@gmail.com

THE LYRA OUTREACH PROGRAMME

This Autumn saw bad weather cancel the FAS sky watch programme in Lowestoft. We received good press coverage, a half page spread of LYRA members with telescopes and our Chairman, Leonard Brundle was interviewed live on two local radio stations. The spin off from this exposure was, however, a new school added to our outreach programme and a sky watch after hours at one school. As reported below the Moon and Jupiter made a great evening for the children.

Our schools programme has grown again this year having risen to 4 schools plus 2 requests from our local library to speak to adult groups. We started on January 11th with a visit to Oulton Broad School for an afternoon display, then on January 25th we were at Poplar School.

April 16th saw us talking to an adult group, The Best of Lowestoft, at Carlton Marshes Nature Reserve. In September we were invited by Lowestoft Library to talk to an adult group, Time Out.

October 3rd saw us at Woods Loke School for 2 sessions, (1 morning and 1 afternoon) and again on 14th November when we returned for an after school science club.

We then went on to Elm Tree school for a morning and afternoon talk on November 22nd and after school the following day we were back, with 3 telescopes, for a skywatching evening. About 30 children attended and a clear night allowed us to observe the gibbous Moon and Jupiter which obligingly had all 4 major moons visible in line abreast for our delight.

The format for the classroom talk is a visual demonstration of the Solar System using the excellent orrery built by Leonard Brundle. This always intrigues the staff as well as the students as they acknowledge that a moving model demonstrates the subject so much better than a book or even a video. The Earth and its Seasons module is another subject that a moving model demonstrates so much better than any other method.

Each Planet is discussed in turn with an accompanying slideshow, class volunteers identify and install Planets onto the orrery and the grand finale is a 10 second countdown when the orrery springs into life and the planets orbit the Sun.

The FAS grant is much appreciated and LYRA will attempt further public skywatches in the New Year as well as offering our services to local schools and societies.

John Perring

ANNUAL YORKSHIRE ASTROMIND

Saturday 13th October 2012 was the date of the annual Yorkshire Astromind competition. The quiz is open to all socieites in Yorkshire with the competing societies taking it in turn to host the event.

This year Huddersfield AS were the host society at their meeting rooms near the railway station in Huddersfield.

Disappointingly only 3 societies accepted the challenge this year. These were Sheffield AS, Mexborough & Swinton AS and Huddersfield AS.

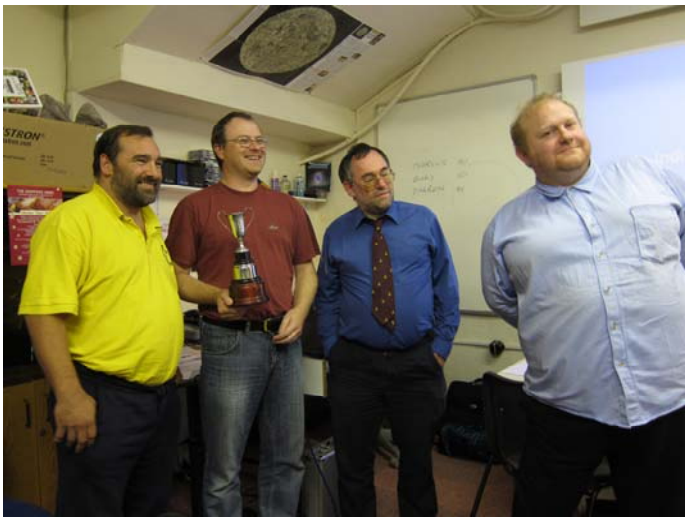
The question master for the day was multiple times winner Neil Haggath.

The quiz had 5 rounds:- 15 General Astronomy Questions, Picture Round, Practical Round, Neil's Nasties & 2 minute quick fire.

As current champion Marcus Armitage from Huddersfield AS started the precedings and took an early 3 point lead over Gary Gawthrope (MSAS) and Darren Swindells (Sheffield AS).

The second round was the picture round & was composed of 15 pictures (some with 2 part answers). These questions are not normally "what is this object" but usually some detail about the object so the contestants have to be able to recognise the object & know something about it, e.g. one picture was a deep image of the Crescent Nebula (NGC 6888) & the question was in what constellation would you find it. At the end of the round Gary had clawed back the 3 point deficit on Marcus and they were tied on 23 points each.

The Practical Round was next and asked the contestants to demonstrate their understanding of the Celestial Sphere, visibility of stars from different locations, distances and the use of star charts. Gary excelled in this round with a maximum 14 points and taking the lead.



Neil's Nasties is a particularly obscure set of questions testing the candidates knowledge eg Add the Messier numbers of the Andromeda Galaxy & Wild Duck Cluster, what is the common name of the Messier object with that number? or Name 5 constellations that are Reptiles. At the end of this round Gary had a lead of 9 points over Marcus.

The final round was the 2 minute quickfire round with a maximum of 25 questions available to the candidate. The round follows the Mastermind rules of 'passes' and 'i've started so i'll finish'. It was decided that Marcus would go last & Darren opted to go first. 2 minutes later and Darren had scored a respectable 14 points to take his final score to 46. Gary was up next & if he could score more than 16 points then Marcus would be unable to beat him. 2 minutes later & Gary had scored 15 points so it was possible for Marcus to win but he'ed need to score at least 24 points. 2 minutes later and we had a new Champion. Marcus had scored 14 points giving Gary a winning margin of 10 points.

The Final scores were Gary 60 points, Marcus 50 points and Darren 46 points (out of a possible 88).

Mexborough & Swinton AS volunteered to host the 2013 Astromind as part of their 35th Anniversary Year which will take place at their meeting room in autumn 2013.

Kelling Heath 2012

Due to work commitments I could not go to Kelling Star Camp last year so was determined to get back there this year and actually made the trip twice, in April and the latest one in September.

April 2012

This was my fifth visit to the Star Camp and, after failing to get the usual caravan we had stayed at previously, decided to camp. Jim Lawler and I travelled down in Jim's estate which, by the time we had packed all our camping gear plus telescopes, etc, was very full indeed. The journey took about five and a half hours after a big hold up near Newark and us taking little C roads to get past. We nearly had a head on crash when some young kid come flying round a bend at something like 50 mph. Once back on the main roads we arrived without incident. There had been drought conditions prior to us arriving and the ground was dry and hard which meant that the tent pegs once in the ground were quite loose, we paid for this later!

The other members of the society had got there the day before and were set up further down the field.

I wanted to come down in April especially to view the Virgo/Coma cluster of galaxies and the sky on the first night did not disappoint. We set up my Celestron 9.25 on its Vixen go to mount and Jim set his big 25 x 100 bino's ready for observing. Even though we were up at the top end of the field across the road from the car park (lights!) we had a great view South West, South and South East with nothing blocking the view. As soon as it started to go dark we were off observing. Starting with Venus while still light then moving across Auriga and clusters M36, 37, 38 & NGC1907 followed by Gemini with views of the Eskimo nebula, M35 & NGC2158. M44 & Iota Cancri being the next targets. After this we moved on into Leo to look at tiny Mars and begin the galaxy hunt. As the sky darkened further we observed the bright Leo galaxies NGC2903,M95, M96, M105, NGC3384, NGC3389, M65, M66 & NGC3628, then on into Coma and the top of Virgo.

One of my favourite galaxies is NGC4565 and from this sky this looked stunning with the edge on spiral arms extending a good distance from the core in my 16mm wide field eyepiece. We went back to this galaxy a few times during the session plus the bright galaxy M64 & globular cluster M53. We now had a few visitors requesting various objects and did our best to oblige. Another tremendous view was of the Sombrero galaxy M104 looking like a flying saucer with the dust lane easily seen. From here we moved back to the Coma region and with Sky Atlas 2000 open on a table were going from one object to the next.

In the end I think we were overwhelmed by the number of galaxies observed. As the sky started to become hazy about 1.30 am we decided to turn the scope off and put stuff away, covering the scope with a cycle cover tied at the base so it would not blow off. We then had a drink sitting out using binoculars and discussing what we had observed, I reckon about 40 galaxies tonight plus assorted open and globular clusters and finally retired to bed about 2am.

About 4am we got hit by high winds and torrential rain which pulled the loosely fitting pegs straight out and we had to get out in the rain and put stronger pegs in and fasten the tent down as best we could. In the morning we were out strengthening everything. During the day the weather improved and we had the PST set up and did some solar viewing. There was a guy dressed in army camouflage who, at various times during the day, would just appear as though he had been hiding in the bushes like the alien in the first predator movie. He informed us that the forecast was bad until midnight and indeed there was a line of black approaching from the West. Jim was cooking the tea outside the tent and had to hurry up because lightning started to appear from the approaching clouds. We hurriedly ate our tea and just got things away when the storm struck. We jumped into Jim's car to shelter with PST, cameras,

(Continued on page 11)

(Continued from page 10)

eyepieces, chairs, etc all thrown into the back. We were amazed to see the guy next door to us run from his tent with his fold up metal chair and sit on it under a couple of trees, not the best place to be in a thunderstorm. When the storm passed we strolled down to see the others and, after the forecast the army chap had given us, were contemplating just sitting round having a drink and a chat when the sky cleared completely just after sunset. I said to Jim I was going to take a chance of no more rain and get the scope ready for observing.

The night turned out to be a fantastic night even better than the one before. We followed the same pattern as last night but trying to look at objects we had not seen yet. The sky was crystal clear and we returned to NGC4565, M64 and M104 which looked even more spectacular than last night. By 2am we had been observing for 6 hours and called it a day (or night!) and carried on with binoculars while sitting in our chairs enjoying a nightcap and toasting the incredible skies. The next day I tried to list everything we had observed and made a note of objects I thought we had missed. I think we captured all the Messier objects in the region and got a great view of Saturn. Sadly this was the last clear night with rain/clouds for the rest of the week. The Saturday was a wash out with very few stalls. Even The Widescreen Centre only had a small stand instead of their usual marquee. We packed up and came home.

September 2012

Drove down with Alan Dennet and this time got stuck in a big jam on the main Kings Lynn road after it was closed due to an accident. We spent an hour travelling about 5 miles. This (and a speeding fine) were the only dampeners on an otherwise excellent long weekend. Myself, Alan, Lol Ashworth and Brian Bolton managed to get a last minute cottage just about 1 mile down the road from Kelling. The weather was superb for the five days and four nights we stayed. The nights were very clear with a bit of haze on the Saturday night after a particularly warm day. There were about 20 members of the LAS gang down all enjoying the excellent skies. Two of the lads, Noel and Peter, let Lol and myself set up our scopes on their pitch. I again took my C9.25, Lol had his 4" refractor, Noel his 16"dob and Pete his 5" refractor and they had various other small scopes and binoculars set up at various times. Also Alan set his 25 x 100 binoculars up on one of the evenings. Over the four nights I wanted to catch some of the many Sagittarius objects before they set but at this time of year this region unfortunately is setting and there is a glow in the same area from the village of Holt. I was still able to catch some of the brighter objects before they set M8, M20, M21, M22, M28, M17 (always reminds me of a yachts sail) & M18 before carrying on up into Scutum M11 & M26 and Ophiuchus M9, M14, M10, M12, IC4665 & NGC6633. After these objects it was onto the more familiar objects like M13 (stunning in the 16" probably the best view I have had of this), M92, NGC6207, NGC6210, M5, M15, M30, NGC1528, Double cluster, Blue snowball, Veil, M27, M29, M39, M31, M32, M110, M103, NGC663, NGC659, NGC457, NGC7789, M52, M51, NGC5195, M101, M81, M82 and probably lots more I cannot remember.

Highlights for me this time were seeing the great Sculptor galaxy NGC253 again. I had not seen this object since we first came to Kelling six years ago. Also being able to see the Veil nebula easily through 15 x 70 binoculars was terrific. The whole five days and four nights were clear and the whole weekend was superb probably the best yet!

By Dave Bentley

Liverpool AS

In Memory of Sir Patrick
A Visit to 'Farthings' Selsey

Brendan and I arrived at 'Farthings', Selsey in the early afternoon of the 12th March 2009 and introduced ourselves to Jane Fletcher who I had met on a previous visit back in the autumn of 2008. Jane is the producer of the 'Sky at Night' television programme and had invited several people to observe Saturn from the garden of Sir Patrick Moore. Unbeknown to us, they would be recording the April edition of the programme.

Following our greetings Jane took us to see 'Sir'. It is always an odd feeling to be in the presence of Patrick as I feel that I have known him most of my life, albeit mainly from television and the occasional meeting here and there. On each occasion he has a way of making you feel at ease and welcome. Indeed his main concern was for our well being and on finding out that we would be 'camping' out in his garden he insisted that we use one of his rooms to sleep in if it got too cold. We assured him that we would be fine and that the offer was appreciated. As the afternoon progressed we were joined by friends, Brian Woosnam, Sue and Steve Reid from Llandrillo, With our tents pitched ready for the late evening ahead we proceeded to set up Brendan's telescope and get it ready for when Saturn would show its face.

During the evening we met Paul Abel who showed us his detailed sketches of Saturn and explained that he was to take part in the programme discussing planetary drawing and visual observing at the eyepiece.

Such is his infectious enthusiasm he even managed to convince Brendan and myself to have a go at sketching the transit and later we would compare what we had observed. Some how, perhaps through hypnosis, we agreed! We were at this point very optimistic despite the build up of cloud since sunset. We gathered for a meal at 20:30 and sat in the dining room chatting about astronomical matters and Patrick was asked to do a 'chant' to rid us of the clouds. Filming had started earlier whilst we were literally pitching our tents much to the surprise of Brendan. I suggested that we ignore them and to carry on erecting the tent. The cameras would hunt us down later as we set up the 'scope' not once but several times until they got all the angles that they required. Oh it is a hard life is this acting!

We stood in the garden waiting for a break in the cloud but, alas, were treated only to a brief momentary glimpse of Saturn which allowed a quick adjustment of the focuser.

As the evening progressed it was becoming evident that the clouds were not moving away and that we would only follow the event on the computer screen, albeit, in real time. Shortly after midnight Dione, Enceladus, Tethys and Rhea would transit Saturn and we would 'observe' them as they slowly marched across the disc of Saturn taking us into the early hours of the morning. In the meanwhile the show was to go on with segments of the April programme being recorded, Patrick and Pete Lawrence holding up a 'beach ball' model of Saturn with rather wobbly rings and a ball on a stick to demonstrate the shadow transit.

Later, Pete and Paul (Abel) were in the observatory (15" Newtonian) discussing the pro and cons of imaging versus sketching and is sketching an art or science? They agree to disagree. Pete Lawrence came over to Steve Reid and chatted to him (on camera) about the image that he had recorded, earlier, showing Saturn with its edge on rings. Steve explained that he had to turn up the gain to bring out the fainter moons.

After Steve it was my turn when I had to explain what we would be hoping to see if there were no clouds in the way. The computer and 'Starry Night' software showed the event clearly I believe. By 04:00 the event, behind a veil of cloud, was coming to an end and the computer was showing only Rhea on the disc, it was time to stop and go inside for a warm and refreshments. When I was younger I would never have guessed that one day I would be in the study of (Sir) Patrick Moore at 04:30 in the morning sharing a glass of whisky. I mean I never used to drink whisky!

Dave Galvin
Liverpool AS

Orwell Dene

INFORMATION GAINED And NEW Questions Raised

In 1874, John Isaac Plummer began work at Orwell Park Observatory as Colonel George Tomline's personal astronomer. The remuneration was generous: £300 *per annum* plus accommodation at *Orwell Dene*, a tied house. *Orwell Dene* is a substantial dwelling, several times the size of a typical estate worker's cottage of the era. It is situated on Levington Road, Nacton, a walk of only ten minutes from the Observatory across the valley in front of Orwell Park Mansion.

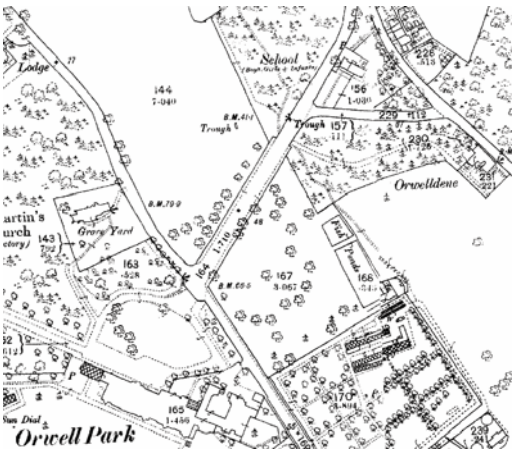
Due to the efforts of several members of OASI, much is now known about Plummer's life and work. However, *Orwell Dene* was one area about which, until recently, little was known; this was tantalising given its proximity to Orwell Park! Things changed back in February of this year when Mike Whybray revealed that he had come to know the owners through a shared hobby interest. I immediately asked him for an introduction and, after a lengthy delay due to various commitments, in July I was finally able to visit the property.

Orwell Park Mansion from Orwell Dene. Mentally remove the trees on the right in the foreground to gain an impression of how imposing the property must have appeared in its heyday!

The owners were most welcoming and helpful, although a little bemused at the unexpected interest being shown in the astronomical connection of their house! Unfortunately, they did not know a great deal of the history of the property, but what they did know they gladly shared.

Nowadays, the house has the form of a spine, running north-west to south-east, parallel to Levington Road, with three sets of rooms and outbuildings off it to the south-west. The spine occupies the same footprint that it did in Plummer's era, and is to a large extent original. An impressive double-height entrance hall off Levington Road leads to a corridor running much of the length of the spine. The large wooden staircase in the hall and the floor tiles in the corridor are original features. The rooms and outbuildings off the spine, however, have been largely redeveloped. Although some of them occupy similar footprints to those of corresponding structures in Plummer's era, they have been extensively remodelled. In 1988, when the current owners purchased the property, the kitchen contained a bread oven and just outside it a well for supplying drinking water, but both features had to make way for a large kitchen extension.

When Plummer resided at *Orwell Dene*, the house provided a magnificent view of Orwell Park Mansion, but the growth of trees in modern times has curtailed this. (High voltage power lines running along the valley in front of the mansion also vitiate the view these days; fortunately they are scheduled eventually to be removed.) Nevertheless, from the foot of the garden it is still possible to gain a sense of how imposing Tomline's mansion must have appeared to Plummer each day as he stepped out of the back door of his house!



Excerpt from the 1881 OS map of the region. Tomline may have planted exotic gardens to the west of Orwell Dene around the path leading to School Hill.

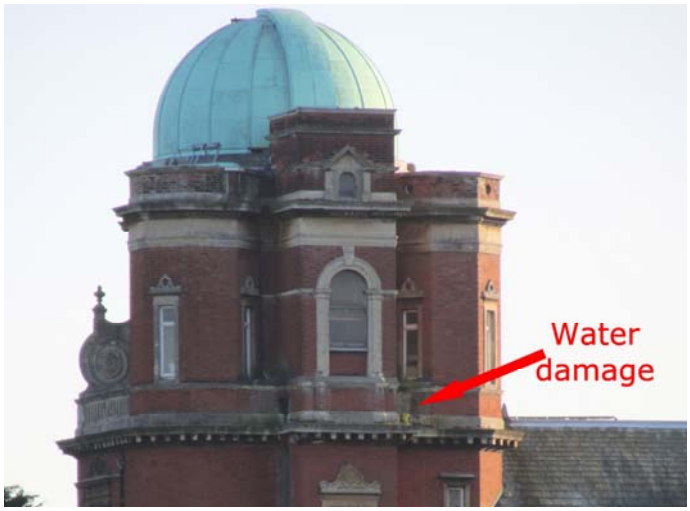
Accepted wisdom in OASI has been that Tomline had *Orwell Dene* built for Plummer. However, the current owners stated that the deeds showed that the property originated from 1760 or 1780 (there is some uncertainty). Unfortunately, the deeds were not available to consult, so this is an area for further research.

Orwell Dene from a balcony on Orwell Park Observatory. The trees and power lines running in front of them (just visible in the image) spoil the view.

The 1881 OS map of the region shows a path running approximately west from *Orwell Dene* to join School Hill. At the join (nowadays also the entrance to Orwell Park Gardens) there are large clumps of bamboo growing on both sides of the road. The owners of *Orwell Dene* understood that, to the immediate west of the property in Plummer's era, Tomline created a garden of interesting and exotic plants for his guests to stroll through, and that the bamboo visible nowadays is all that remains of a much more extensive planting. Clearly, another area for local history research!

Although the visit to *Orwell Dene* confirmed the generous nature of the accommodation which Tomline provided for his astronomer, it raised additional questions that should keep the historians of OASI busy for some time yet!

Orwell Dene from its rear garden. The furthest visible roof covers the spine of the house, much as it was in Plummer's era. Closer parts of the house have been redeveloped in modern times.



Close-up of Orwell Park Observatory from the north-east. Unfortunately, there is evidence of considerable water damage to the brickwork.

Finally, on a different tack, the garden of *Orwell Dene* provides an opportunity to inspect the exterior fabric of the observatory from the north-east, a view that is not otherwise easily obtained. Detailed examination of photographs of the brickwork reveals serious water damage, providing further conformation, if any were needed, of the urgent need for measures to stabilise the fabric and begin renovations.

James Appleton
Orwell AS Ipswich

Autumn with Shropshire AS

Thursday 25th October saw the first of this year's Astronomy Club meetings at Trinity C E School in Ford, sadly cloud-affected. Fourteen young astronomers attended – including six girls.

The planned lunar observing had to be abandoned so the telescope was set up inside and trained on a nearby lightning conductor. Some of the children had never used a telescope so it was useful for them to see how it worked before they needed to use it for real. Some found it difficult to close the correct eye for observing.

The rest of the session was devoted to how the children could do astronomy without a scope. We began by talking about the need to wrap up warmly and how to avoid a stiff neck by using summer deckchairs or sunloungers (I shall be interested to see how many of the boys followed my suggestion of wearing their pyjama bottoms as a extra layer under their day trousers). We then talked about the distribution of stars across the sky, especially the Milky Way.

Stars also come in different sizes, different luminosities and even different colours. We then looked at the patterns which stars appear to make in the sky – the constellations, particularly Ursa Major, Cassiopeia and Cygnus. While we were busy with this, the Head was downloading ***Stellarium*** onto the school computers. We ended the hour playing generally with Stellarium, which was as new to me as it was to the children. They were fascinated that they could set the sky for anywhere, any time and any direction.

Saturday 27th saw the monthly observing meeting at Fords Heath. This was sparsely attended as many members were helping on the same night with the Shropshire Wildlife Trust event on the Stiperstones – at

Stan Courtney, **Andy Dowsett** and **David Woodward** Meole Brace 30/11/2012

8.00pm there was just me and my scope. It was also the final day of the caravan season, with a bonfire and firework party on the caravan park, which finished just as I arrived. We now have the place to ourselves for the winter.

The weather forecast looked good and indeed Saturday dawned with a totally cloudless sky, with the first of the season's sharp frosts. At 8.00pm the sky was still clear, but for some old thin plane trails. Much of the sky was hidden by the light of a three-quarter full moon in the south-eastern sky, which at least made unloading the equipment easier than usual.

I had just finished setting up when I was joined by a couple from Habberley who were new to the hobby. They had attended the Moonwatch at Attingham which they had enjoyed, except for not seeing the moon. I duly obliged with a 20mm eyepiece and moon filter giving 50x magnification. We then turned our attention to Jupiter which was just rising in the slight haze. This was again a first for the couple.

Next we were joined by a man from Shrewsbury. He said he had been a member some years ago, but had lapsed and was getting back into the hobby. He has a 16" Newtonian at home.

While Jupiter was OK at 50x, I put in first one and then two back-to-back 2x Barlows. With the magnification at 200x, Jupiter went across the field of view quite rapidly, requiring regular adjustments, but the disk clearly showed the northern and southern bands – no red spot was evident. The Galilean moons were also clearly seen.

While it was good to have such a clear view of a large part of the lunar surface, its brightness rather washed out many other targets. I managed to find Albireo in Cygnus, and a very faint Ring Nebula in Lyra, but the Andromeda galaxy was lost in the lunar glare.

Nevertheless, despite the shortage of visible targets, we were able to observe comfortably until 10.00pm, when it suddenly became decidedly damp and chilly, presumably as the forecast rain front for Saturday night/Sunday morning began to move in. And so at 10.00pm we called it a day and retired home for the customary (and much welcome) cup of hot cocoa.

Nov 2012

There are times when it seems that the gods of the weather are taking a particular joy in creating chaos for us astronomers, as was very evident this month. Wednesday 22nd was a beautiful clear winter day, with a bright quarter moon in a blue sky in the late afternoon. This seemed to bode well for the November astronomy club at Trinity School, Ford, for the following day. How fickle can the weather be?

Thursday 23rd dawned wet, dark and very windy as a vicious low pressure system drove in squally southerly gale-force winds, with heavy and persistent downpours. As a result, the area was strewn with bits of tree and there were a number of localised flash floods. Not surprisingly a number of families thought that caution was the better part of valour and headed for home early at the end of school. However the four brave pupils who did attend proved to be bright, keen and remarkably knowledgeable for their tender years.

At the October meeting we had begun to look at the constellations and, using Stellarium, we were able to take a leisurely stroll around the sky, starting with Ursa Major – the broken-handled saucepan. We moved on to Polaris, the star which does not move and then on to the wonky W of Cassiopeia. From there we found our way to Andromeda and Pegasus (***Stellarium*** has a belting image of the galaxy). From there we found Gemini, Perseus and Taurus, ending up with Orion (again Stellarium has an excellent shot of the nebula).

We then came closer to home with a look at the Solar System, beginning with Mercury. Wikipedia has an excellent shot of the planet, which the children quickly likened to the Moon. The image contains a number of craters with central peaks, which led us to think about how craters form.

A view of Venus led to some thoughts on runaway greenhouse gases and our own global warming. And more by luck than judgement we ran out of time as we got back to Earth, probably a fitting place to stop.

Annoyingly the following morning of Friday 23rd dawned bright and clear, with Venus clearly visible as a crescent even to the naked eye in the east, and with Jupiter further west. As the day wore on cloud began

Stan Courtney showing the Moon Meole Brace 30/11/2012

to build up and the forecast suggested a further low pressure system would sweep in with further cloud, wind and heavy rain just in time for the observing meeting at Fords Heath on Saturday 24th. And while the high wind did not arrive, the rain and cloud did, giving a thoroughly miserable day and evening which precluded any observing. The final insult materialised on the following Sunday morning, which dawned blustery but clear, with not a cloud in the sky.

We shall not be meeting in December – it's a church school and they will be busy with all things Christmas – and will re-convene in January. Let's hope for better luck next month.

Stan Courtney

Light from Darkness:
Brilliant Stars Emerging from Dusty Stellar Nursery

An evocative new image from the European Southern Observatory shows a dark cloud where new stars are forming, along with a cluster of brilliant stars that have already emerged from their dusty stellar nursery. The new picture was taken with the MPG/ESO 2.2-metre telescope at the La Silla Observatory in Chile and is the best image ever taken in visible light of this little-known object.

On the left of this new image there is a dark column resembling a cloud of smoke. To the right shines a small group of brilliant stars. At first glance these two features could not be more different, but they are in fact closely linked. The cloud contains huge amounts of cool cosmic dust and is a nursery where new stars are being born. It is likely that the Sun formed in a similar star formation region more than four billion years ago.

This cloud is known as Lupus 3 and it lies about 600 light-years from Earth in the constellation of Scorpius (The Scorpion). The section shown here is about five light-years across.

As the denser parts of such clouds contract under the effects of gravity they heat up and start to shine. At first this radiation is blocked by the dusty clouds and can only be seen by telescopes observing at longer wavelengths than visible light, such as the infrared. But as the stars get hotter and brighter their intense radiation and stellar winds gradually clear the clouds around them until they emerge in all their glory.

The bright stars right of the centre of this new picture form a perfect example of a small group of such hot young stars. Some of their brilliant blue light is being scattered off the remaining dust around them. The two brightest stars are bright enough to be seen easily with a small telescope or binoculars. They are young stars that have not yet started to shine by nuclear fusion in their cores and are still surrounded by glowing gas [1]. They are probably less than one million years old.

Although they are less obvious at first glance than the bright blue stars, surveys have found many other very young stellar objects in this region, which is one of the closest such stellar nurseries to the Sun.

Star formation regions can be huge, such as the Tarantula Nebula where hundreds of massive stars are being formed. However, most of the stars in our and other galaxies are thought to have formed in much more modest regions like the one shown here, where only two bright stars are visible and no very heavy stars are formed. For this reason, the Lupus 3 region is both fascinating for astronomers and a beautiful illustration of the early stages of the life of stars.

Note *These are known as Herbig Ae/Be stars after the astronomer who first identified them. The A and B refer to the spectral types of the stars, somewhat hotter than the Sun, and the "e" indicates that emission lines are present in their spectra, due to the glow from the gas around them. They shine by converting gravitational potential energy into heat as they contract.*

Science Daily - Jan. 16, 2013

The Lupus 3 dark cloud and associated hot young stars. (Credit: ESO/F. Comeron)

Boeing CST-100: Next-Generation Spaceship — *Elizabeth Howell, SPACE.com Contributor*

The Boeing Company is an international aviation firm that is perhaps best known for building super-large passenger jets. But in the space field, the company is an established presence because of its work on the shuttle and the International Space Station.

This work is preparing Boeing to make a new spacecraft to carry astronauts. Boeing is constructing the CST-100 capsule, a spaceship that is similar in shape to the Apollo spacecraft as well as the Orion Crew Exploration Vehicle being constructed right now by Lockheed Martin and its partners.

When finished, the CST-100 will transport astronauts into Earth orbit and to the International Space Station.

NASA is providing Boeing with funding to achieve this goal, with the aim of starting up a new spacecraft program in the wake of the shuttle's retirement. Flights should take place around the middle of the next decade.

This artist's illustration depicts a Boeing CST-100 spacecraft approaching a private inflatable space station complex designed by Bigelow Aerospace. CREDIT: Boeing

Partners seeking business markets

The spacecraft is designed to carry up to seven astronauts, with additional cargo also possible if fewer astronauts fly in a particular mission. Measuring 14.8 feet (4.5 meters) across at its widest point, the gumdrop-shaped spacecraft will first fly into space aboard Atlas 5 rockets.

Boeing isn't going at this venture alone. Another destination for its spacecraft could be an inflatable space station being proposed by Bigelow. As such, Bigelow has been committing some resources to the CST-100's development. [Also, Boeing plans to grant Space Adventures the chance to sell any unused seats on the CST-100 for joyrides into low Earth orbit. However, the company has said it is not entirely sure what sort of business markets will arise for its spacecraft, if any.

Boeing is testing a 12-by-14 inch aluminum model of its CST-100 space capsule in a wind tunnel at NASA's Ames Research Center. The company has said it hopes the CST-100 will be flying astronauts to and from the International Space Station by 2015. CREDIT: Boeing

"The market is obviously going to be there," said John Mulholland, vice president and program manager for Boeing Commercial Programs, in a 2012 SPACE.com interview.

"I hope it's in the near-term…but I'd say right now, it is soft because no one has been able to penetrate and really do it on a recurring basis. We'll see."

Money from NASA

NASA is looking to develop a new spacecraft to replace the shuttle. As such, it is providing money to several space companies for development of private spaceships. The program, called Commercial Crew Development (CCDev), has proved to be a lucrative one for Boeing.

The aerospace company received $18 million from NASA in February 2010 in the program's first round of funding, then an additional $92 million in the second round in April 2011. A smaller contract, for $9.99 million, was awarded for certification qualifications in 2012.

In addition to Boeing's CST-100, NASA recently provided financial support for Space Exploration Technologies (SpaceX)'s Dragon spacecraft and Sierra Nevada's Dream Chaser. These companies have been meeting flight milestones of their own in recent years, with SpaceX having a banner one in 2012 as Dragonreached the International Space Station twice.

But NASA has received less money than it asked for; in 2012, Congress offered only $406 million for commercial crew development, less than half of NASA's $850 million request. This has pushed back the timeline for the first commercial flight by at least two years, the agency has said.

Still, the agency hopes that at least one of these spacecraft will be ready in the 2016-17 timeframe to launch humans into space, which would reduce the current dependency on Russia's Soyuz spacecraft. Boeing has stated it believes it can fly CST-100 by 2015 or 2016, depending on funding.

"These contracts represent important progress in restoring human spaceflight capabilities to the United States," Phil McAlister, director of NASA's commercial spaceflight development division, said in a statement in December 2012.

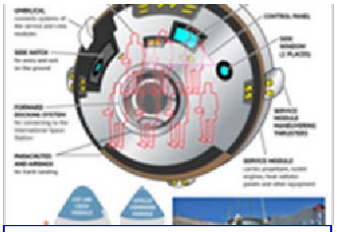
"NASA and its industry partners are committed to the goal of safely and cost-effectively launching astronauts from home within the next five years."

Preparing for the first flight

As the funding continues to flow from NASA, Boeing has been putting the CST-100 through a suite of tests to get it ready for the first spaceflights. [Infographic: Boeing's Private Space Capsule]

In 2011, the company put a 12-by-14 inch model of the CST-100 in a wind tunnel to determine the spacecraft's aerodynamic characteristics. The model was expected to be put in 20 different positions to simulate different phases of an abort-mode landing.

The next year, Boeing did parachute drop tests of the CST-100 to determine how well the spacecraft's parachutes and air bags worked. Unlike the Apollo missions, the CST-100 will touch down on land, making the air bags especially important for the job.



Boeing is developing its capsule for use ferrying astronauts to Earth orbit and to the International Space Station. CREDIT: Karl Tate, SPACE.com Contributor

"It's been an interesting last couple of years for us," Roger Krone, president of Boeing's network and space systems, said in 2012.

"I think many people in the industry associate Boeing with the shuttle program and the International Space Station. [This is] kind of a chance for us to rethink what our space strategy is."

Later in the year, the company and NASA determined what would be the basic layout of the spacecraft, which NASA considers an important milestone under the third round of CCDev.

As late as 2012, Boeing said it is very dependent on NASA's money for continued work on CST-100. Should the funds dry up, Boeing hinted they may have to dial back development of the spacecraft.

"It's a tough question," said Keith Reiley, deputy program manager of Boeing's commercial crew development, at the inaugural Spacecraft Technology Expo in Los Angeles in May 2012.

"I frankly don't know. We've thought about it, but there's not anything official that we've done. Obviously NASA would be providing a significant amount of money. Would The Boeing Company be willing to continue that at that level? I doubt it – maybe at some lower level, but I really don't know."

However, as of early 2013 there is no hint yet of Boeing preparing to slow down. The company will continue running tests on CST-100, still firmly focused on bringing astronauts into space by the middle of the decade.

Boeing's next competition will be for a second phase of certification contract, which is expected to start in 2014. This is expected to include all the verification and development milestones needed for human spaceflights to the International Space Station.

NASA officials have noted it will be an open competition, so the CST-100 will once again have to prove itself in the next round.

SPACE.com

Watery Science 'Jackpot' Discovered by Curiosity

The Curiosity rover hit the science "jackpot" and has discovered widespread further evidence of multiple episodes of liquid water flowing over ancient Mars billions of years ago when the planet was warmer and wetter, scientists announced. The watery evidence comes in the form of water bearing mineral veins, cross-bedded layering, nodules and spherical sedimentary concretions.

Any day now NASA's mega robot will be instructed to drill directly into veined rocks where water once flowed, the team announced at a media briefing this week.

Delighted researchers said Curiosity surprisingly found lots of evidence for light-toned chains of linear mineral veins inside fractured rocks littering the highly diverse Martian terrain – using her array of ten state-of-the-art science instruments. Veins form when liquid water circulates through fractures and deposit minerals, gradually filling the insides of the fractured rocks over time.

Sometime in the next two weeks or so, NASA's car sized rover will carry out history's first ever drilling inside a Martian rock that was "percolated" by liquid water – an essential prerequisite for life as we know. A powdered sample will then be delivered to the robots duo of analytical chemistry labs (CheMin & SAM) to determine its elemental composition and ascertain whether organic molecules are present.

The drill target area is named "John Klein" outcrop, in tribute to a team member who was the deputy project manager for Curiosity at JPL for several years and who passed away in 2011.

"We identified a potential drill target and are preparing to do drill activities in the next two weeks. We are ready to go," said Richard Cook, the project manager of NASA's Jet Propulsion Laboratory (JPL) in Pasadena, Calif.

"Drilling [into a rock] is the most significant engineering activity since landing. It is the most difficult aspect of the surface mission, interacting with an unknown surface terrain, and has never been done on Mars. We will go slowly. It will take some time to deliver samples to CheMin and SAM and will be a great set of scientific measurements."

"The scientists have been let into the candy store," said Cook referring to the unexpected wealth of science targets surrounding the rover at this moment.

"There is a high diversity of rocks types here to characterize," added Mike Malin, Mastcam principal investigator of Malin Space Science Systems (MSSS). "We see layering, veins and concretions. The area is still undergoing some changes."

Curiosity is just a few meters away from 'John Klein' and will drive to the site shortly from her location inside 'Yellowknife Bay' beside the 'Snake River' rock formation. To see where Curiosity is in context with 'John Klein' and "Snake River', see our annotated context mosaic (by Ken Kremer & Marco Di Lorenzo) as the rover collects data at a rock ledge.

The white colored veins were discovered over the past few weeks- using the high resolution mast- mounted imaging cameras and ChemCam laser firing spectrometer -at exactly the vicinity where Curiosity is currently investigating ; around a shallow basin called Yellowknife Bay and roughly a half mile away from the landing site inside Gale Crater.

"This lowest unit that we are at in Yellowknife Bay, the very farthest thing we drove to, turns out to be kind of the 'jackpot' unit here," said John Grotzinger, the mission's chief scientist of the California Institute of Technology. "It is literally shot through with these fractures and vein fills."

Shortly after landing the team took a calculated gamble and decided to take a several months long detour away from the main destination of the towering, sedimentary mountain named Mount Sharp, and instead drive to an area dubbed 'Glenelg' and home to 'Yellowknife Bay', because it sits at the junction of a trio of different geologic terrains. Glenelg exhibits high thermal inertia and helps put the entire region in better scientific context. The gamble has clearly payed off.

"We chose to go there because we saw something anomalous, but wouldn't have predicted any of this from orbit," said Grotzinger.

The Chemistry and Camera (ChemCam) instrument found elevated levels of calcium, sulfur and hydrogen. Hydrogen is indicative of water.

The mineral veins are probably comprised of calcium sulfate – which exists in several hydrated (water bearing) forms.

"The ChemCam spectra point to a composition very high in calcium. These veins are likely composed of hydrated calcium sulfate, such as bassinite or gypsum, depending on the hydra-

(Continued on page 18)

Curiosity found widespread evidence for flowing water in the highly diverse, rocky scenery shown in this photo mosaic from the edge of Yellowknife Bay on Sol 157 (Jan 14, 2013). The rover will soon conduct 1st Martian rock drilling operation at flat, light toned rocks at the outcrop called "John Klein", at center. 'John Klein' drill site and 'Sheep Bed' outcrop ledges to right of rover arm are filled with numerous mineral veins and spherical concretions which strongly suggest precipitation of minerals from liquid water. 'Snake River' rock formation is the linear chain of rocks protruding up from the Martian sand near rover wheel. Credit: NASA/JPL-Caltech/Ken Kremer/Marco Di Lorenzo

Image caption: Mineral veins of calcium sulfate discovered by Curiosity at 'Sheepbed' Outcrop. These veins form when water circulates through fractures, depositing minerals along the sides of the fracture, to form a vein. These vein fills are characteristic of the stratigraphically lowest unit in the "Yellowknife Bay" area where Curiosity is currently exploring and were imaged on Sol 126 (Dec. 13, 2012) by the telephoto Mastcam camera. Image has been white-balanced. Credit: NASA/JPL-Caltech/MSSS

(Continued from page 17)

tion state," said ChemCam team member Nicolas Mangold of the Laboratoire de Planétologie et Géodynamique de Nantes in France. "On Earth, forming veins like these requires water circulating in fractures and occur at low to moderate temperatures."

The newly found veins appear quite similar to analogous veins discovered in late 2011 by NASA's Opportunity rover – Curiosity's older sister – inside Endeavour crater and nearly on the opposite side of Mars. See our Opportunity vein mosaic featured at APOD on Dec. 11, 2011 to learn more about veined rocks.

"What these vein fills tell us is water moved and percolated through these rocks, through these fracture networks and then minerals precipitated to form the white material which ChemCam has concluded is very likely a calcium sulfate, probably hydrated in origin," Grotzinger explained.

"So this is the first time in this mission that we have seen something that is not just an aqueous environment, but one that also results in precipitation of minerals, which is very attractive to us."

Yellowknife Bay and the 'John Klein' drilling area outcrop are chock full of mineral veins and sedimentary concretions.

"When you put all this together it says that basically these rocks were saturated with water. There may be several phases to this history of water, but that's still to be worked out."

"This has been really exciting and we can't wait to start drilling," Grotzinger emphasized.

Curiosity can drill about 2 inches (5 cm) into rocks. Ultimately a powdered sample about half an aspirin tablet in size will be delivered to SAM and CheMin after a few weeks. All rover systems and instruments are healthy, said Cook.

Grotzinger said that Curiosity will be instructed to drive over the veins to try and break them up and expose fresh surfaces for analysis. Then she will drill directly into a vein and hopefully catch some of the surrounding material as well.

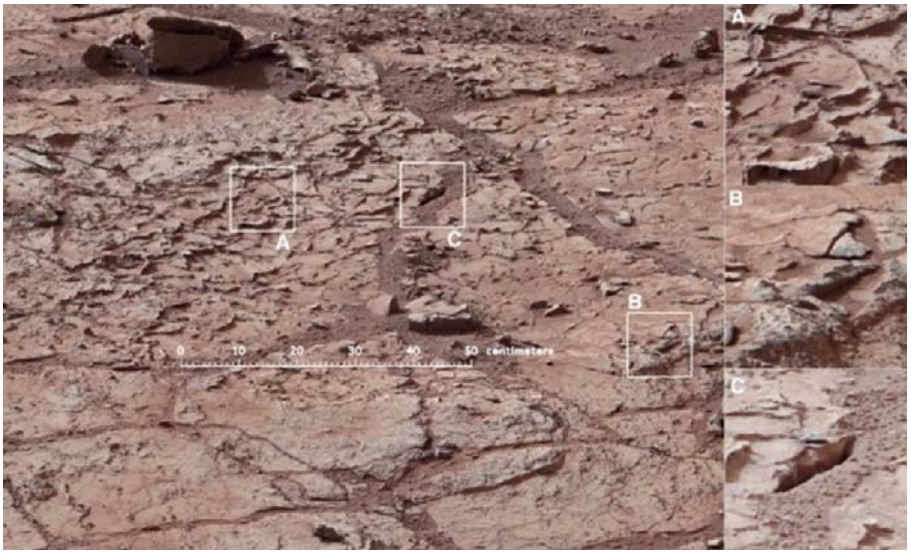


Image caption: 'John Klein' Site Selected for Curiosity's Drill Debut. This view shows the patch of veined, flat-lying rock selected as the first drilling site. The rover's right Mast Camera equipped with a telephoto lens, was about 16 feet (5 meters) away from the site when it recorded this mosaic on sol 153 (Jan. 10, 2013). The area is shot full of fractures and veins, with the intervening rock also containing concretions, which are small spherical concentrations of minerals. Enlargement A shows a high concentration of ridge-like veins protruding above the surface. Some of the veins have two walls and an eroded interior. Enlargement B shows that in some portions of this feature, there is a horizontal discontinuity a few centimeters or inches beneath the surface. The discontinuity may be a bed, a fracture, or potentially a horizontal vein. Enlargement C shows a hole developed in the sand that overlies a fracture, implying infiltration of sand down into the fracture system. Image has been white-balanced. Credit: NASA/JPL-Caltech/MSSS

"This will reveal the mineralogy of the vein filling material and how many hydrated mineral phases are present. The main goal is this will give us an assessment of the habitability of this environment."

As the rover has driven down the shallow depression to deeper stratigraphic layers, the units are older in time.

After the first drill sample is fully analyzed, Grotzinger told me that the team will reevaluate whether to drill into a second rock.

The team doesn't yet know whether the flowing water from which the veins precipitated was a more neutral pH or more acidic. "It's too early to tell. We need to drill into the rock to tell and determine the mineralogy," Grotzinger told me. Neutral water is more hospitable to life.

How long the episodes of water flowed is not yet known and it's a complex history. But the water was at least hip to ankle deep at times and able to transport and round the gravel.

"There are a broad variety of sedimentary rocks here, transported from elsewhere. Mars was geologically active in this location, which is totally cool !," said Aileen Yingst, MAHLI deputy principal investigator. "There are a number of different transport mechanisms in play

Drilling goes to the heart of the mission and will mark a historic feat in planetary exploration – as the first time that an indigenous sample has been cored from the interior of a rock on another planet and subsequently analyzed by chemical spectrometers to determine its elemental composition and determine if organic molecules are present .

The high powered hammering drill is located on the tool turret at the end of the car-sized robots 7 foot (2.1 meter) long mechanical arm . It is the last of Curiosity's ten instruments that remains to be checked out and put into action.

Curiosity landed on the Red Planet five months ago inside Gale Crater to investigate whether Mars ever offered an environment favorable for microbial life, past or present and is now nearly a quarter of the way through her two year prime mission.

Curiosity might reach the base of Mount Sharp by the end of 2013, which is about 6 miles (10 km) away as the Martian crow flies.

Ken Kremer
Universe Today

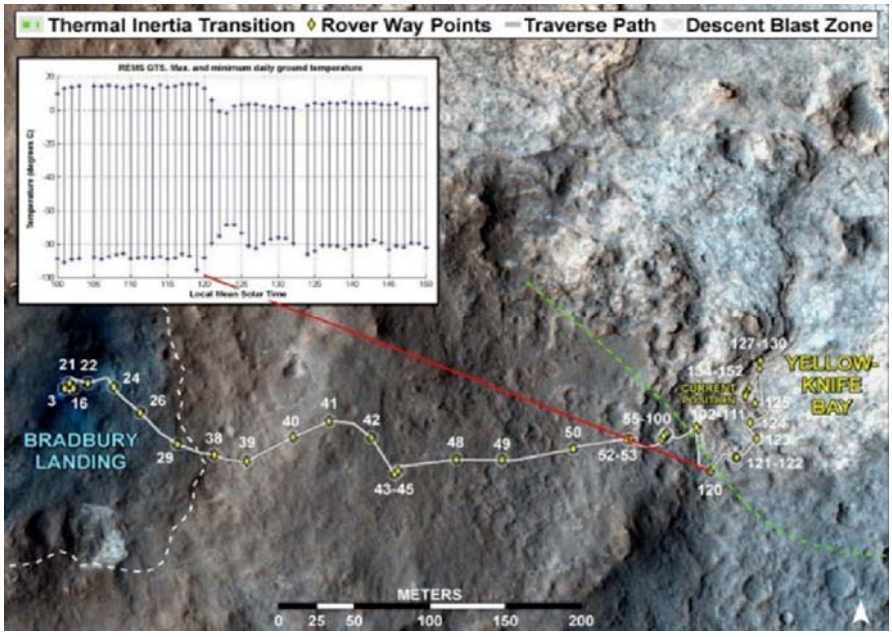


Image caption: Curiosity's Traverse into Different Terrain. This image maps the traverse of NASA's Mars rover Curiosity from "Bradbury Landing" to "Yellowknife Bay," with an inset documenting a change in the ground's thermal properties with arrival at a different type of terrain. credit: NASA/JPL-Caltech/Univ. of Arizona/CAB(CSIC-INTA)/FMI

Read more:

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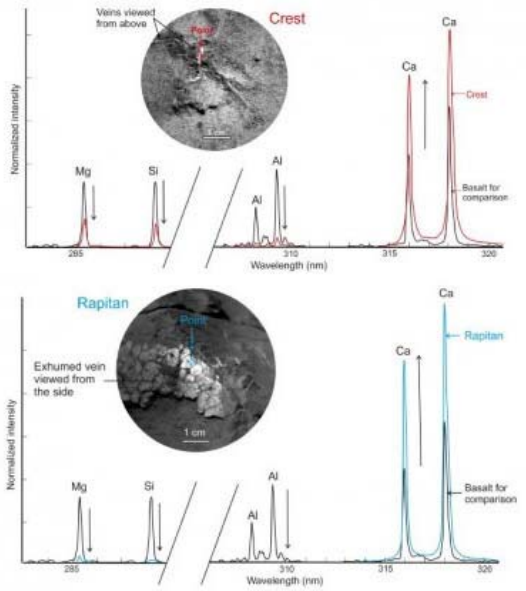

Image Caption: Calcium-Rich Veins in Martian Rocks. This graphic shows close-ups of light-toned veins in rocks in the "Yellowknife Bay" area of Mars together with analyses of their composition. The top part of the image shows a close-up of the rock named "Crest," taken by the remote micro-imager (RMI) on Curiosity's Chemistry and Camera (ChemCam) instrument above the analysis of the elements detected by using ChemCam's laser to zap the target. The spectral profile of Crest's light-colored vein is shown in red, while that of a basaltic calibration target of known composition is shown in black. The bottom part of the image shows ChemCam's close-up of the rock named "Rapitan" with the analysis of its elemental composition. The spectral profile of Rapitan's light-colored vein is shown in blue, while that of a basaltic calibration target of known composition is shown in black. These results suggest the veins are unlike typical basaltic material. They are depleted in silica and composed of a calcium-bearing mineral. Credit: NASA/JPL-Caltech/LANL/CNES/IRAP/ LPGNantes/CNRS

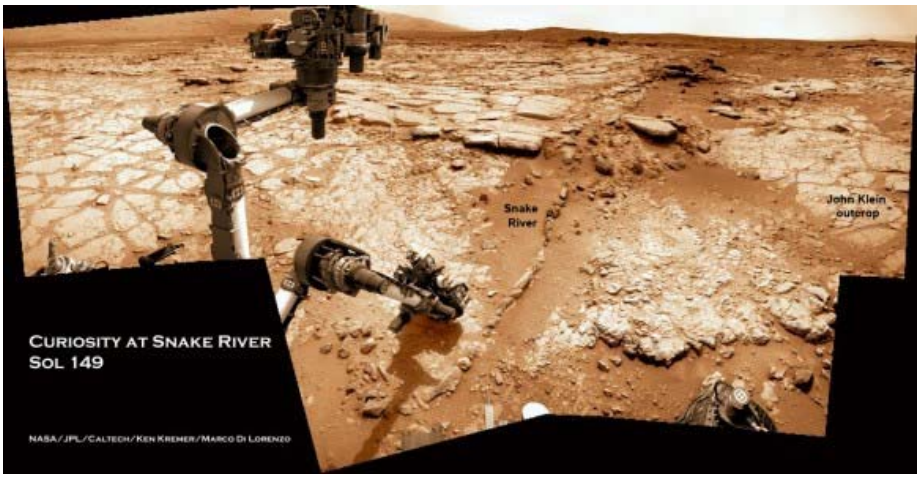

Image caption: Curiosity will carry out 1st rock drilling at 'John Klein' outcrop visible in this time lapse mosaic showing movements of Curiosity rover's arm on Sol 149 (Jan. 5, 2013) at Yellowknife Bay basin where the rover has found widespread evidence for flowing water. Curiosity discovered hydrated mineral veins and concretions around the rock ledge ahead . She next drove there for contact science near the slithery chain of narrow protruding rocks known as 'Snake River. Photomosaic stitched from Navcam raw images and colorized. Credit: NASA/JPL-Caltech/Ken Kremer/Marco Di Lorenzo

NASA Eyes 'Hedgehog' Invasion of Mars Moon Phobos

by Elizabeth Howell, SPACE.com Contributor

A daring, "Angry Birds"-like NASA mission could bombard a Martian moon with robotic "hedgehog" probes in the next few decades, scientists say.

The space hedgehogs are actually small, spiky, spherical rovers that form part of a novel mission idea called Phobos Surveyor. The rovers would take advantage of the low gravity on the Mars moon Phobos, its sister moon Deimos, or asteroids in the solar system. Engineers have designed the devices to work in concert with a nearby mother ship.

The hedgehogs would work well in the low gravity of the 16-mile-wide (27 kilometers) Phobos, a force 1,000 times weaker than the gravity on Mars itself, where NASA's Curiosity and Opportunity rovers currently explore, said researcher Marco Pavone of Stanford University. Gravity on Mars is about one-third that of the Earth.

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"The problem with [conventional] rovers is, in low gravity, you don't have any traction. That means your wheels spin and you do not move," said Pavone, who developed the hedgehog mission concept. [Boldest Mars Missions in History]

Robot hedgehogs in space

Instead of using wheels to move across a planetary surface, however, the hedgehogs would use internal, rotating discs. Plans call for three discs encased in each hedgehog. Each spacecraft would measure about 2 feet (0.6 meters) in diameter, and NASA has already built a prototype version, researchers said.

The three discs inside a hedgehog point in different directions, giving controllers the ability to move the devices with precision, Pavone said. Slightly speeding up the discs can send the hedgehogs tumbling, and a quick spin can make the hedgehog hop to a nearby location, he added.

To get to Phobos, the hedgehogs will potentially hitch a ride inside the proposed Phobos Surveyor, which could be a Discovery-class NASA mission with a cost of about $250 million and a streamlined development schedule to meet its science goals. At best, the Phobos mission could launch in 10 to 20 years, but that assumes the concept is approved and funded.

The exploitation of inertial motion is not entirely new to space exploration, as the Japanese Space Agency's Hayabusa spacecraft pursued a similar idea. That craft released a small lander while above the asteroid Itokawa.

Dubbed MINERVA (for MIcro/Nano Experimental Robot Vehicle for Asteroid), Hayabusa's tiny lander was supposed to bounce on the asteroid using rotating actuators. But it never made it to the surface.

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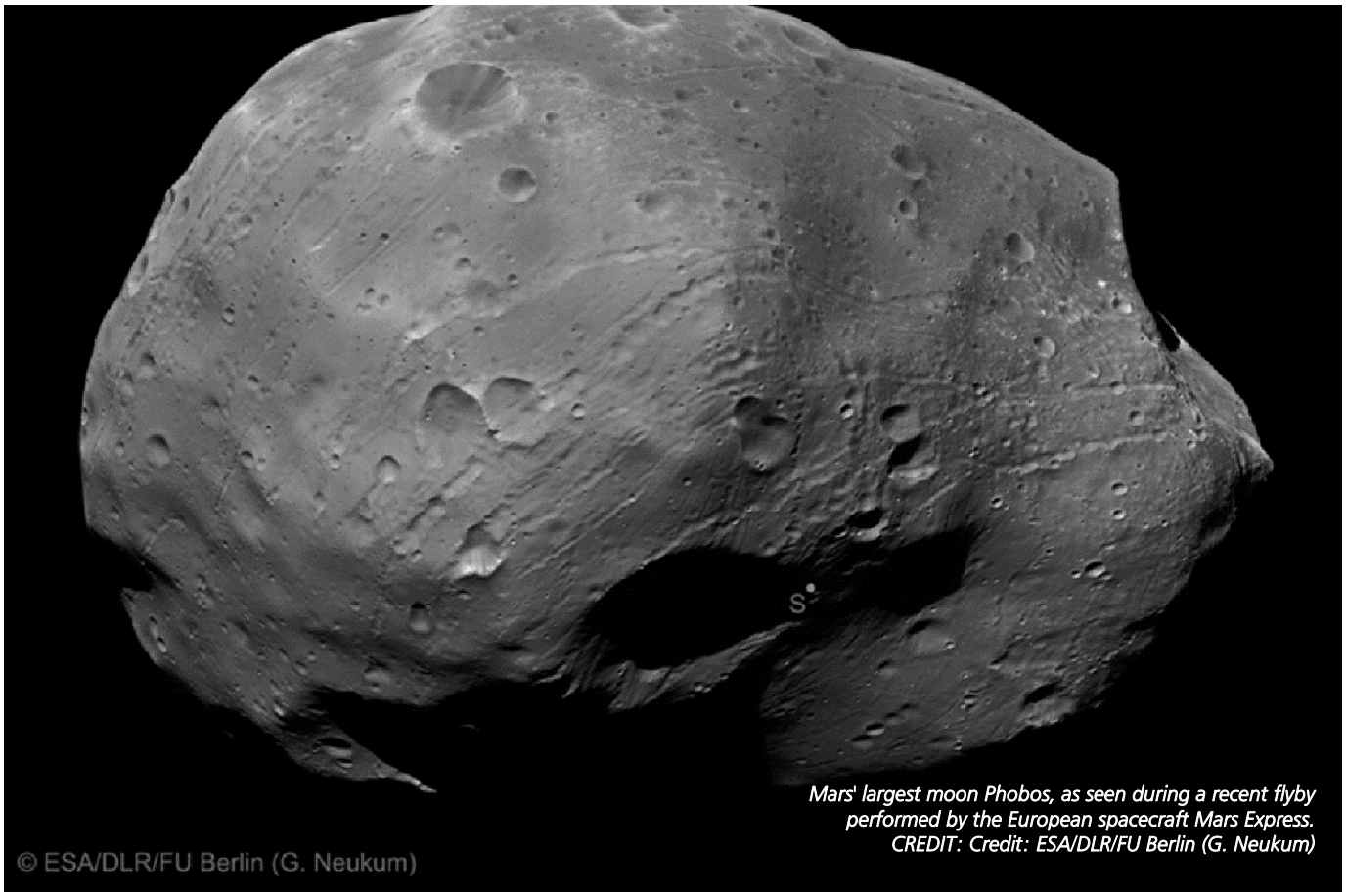

Mars' largest moon Phobos, as seen during a recent flyby performed by the European spacecraft Mars Express. CREDIT: Credit: ESA/DLR/FU Berlin (G. Neukum)

(Continued from page 19)

NASA's hedgehog would have the ability to not only hop, but also tumble, which would make it potentially a more versatile lander than MINERVA if it were to arrive on Phobos, the research team said.

Separately, NASA's Jet Propulsion Laboratory has developed a nanorover concept, which envisions a rover that can both hop and roll. This device was planned for a space mission, but that mission never got off the ground.

Probing Phobos' origins

Pavone's team has already built two versions of the hedgehogs, but the rovers still require several design changes before they could make it to space. The researchers also plan further testing, including flying the hedgehogs on parabola flights that simulate low gravity, just to see how they behave.

Pavone said he hopes the hedgehogs will help solve a long-standing mystery: Did Phobos form at the same time as Mars, or is it an asteroid pulled in by the Red Planet's gravity?

"By providing answers to this equation, it will be possible to calibrate this model ... for [other] asteroids through the solar system," Pavone said.

According to the plan, five or six hedgehogs could make the trip to Phobos, which would take about two years. The Phobos Surveyor mother ship could then spend a few months analyzing potential landing sites before releasing the hedgehogs, one at a time.

The mother ship would stay in orbit and map the surface's composition, though scientists are still discussing which actual instruments to send aboard the craft. The ship could also relay the hedgehogs' findings back to Earth.

The Phobos Surveyor study is funded under the NASA Innovative Advanced Concepts Program and includes contributors from NASA's Jet Propulsion Laboratory, the Massachusetts Institute of Technology and Stanford.

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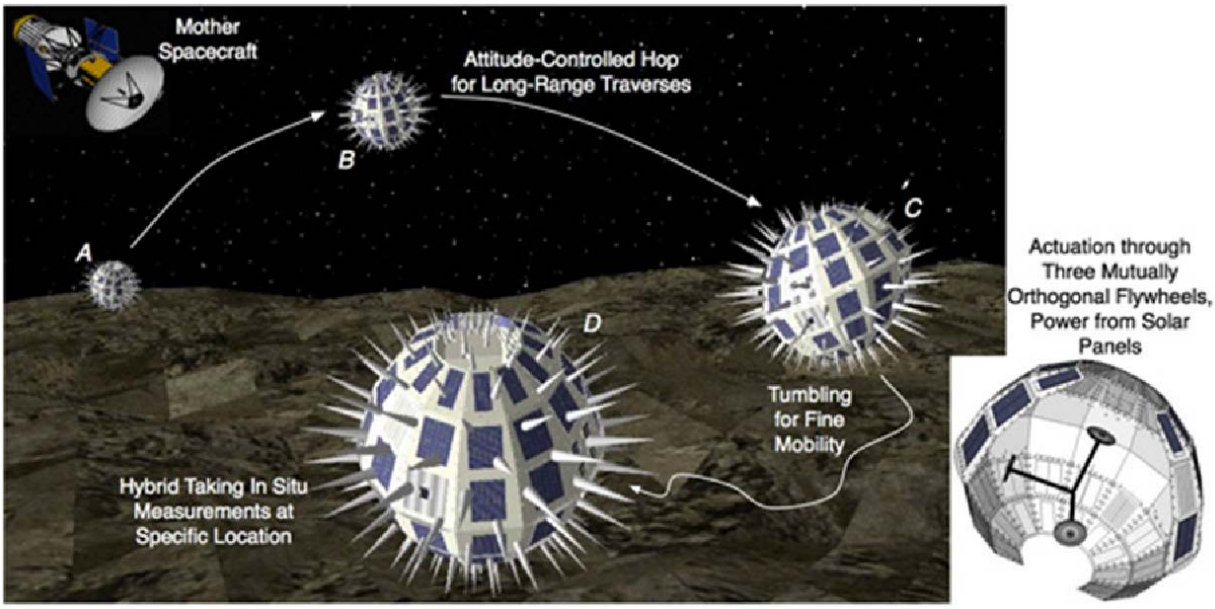


This illustration depicts the Phobos Surveyor mission concept, which would land small, spiky "hedgehog" probes on Mars' largest moon, Phobos, while a mother ship monitored the landers from nearby. CREDIT: Stanford University

Hidden Treasure in Large Magellanic Cloud

Nearly 200,000 light-years from Earth, the Large Magellanic Cloud, a satellite galaxy of the Milky Way, floats in space, in a long and slow dance around our galaxy. Vast clouds of gas within it slowly collapse to form new stars. In turn, these light up the gas clouds in a riot of colours, visible in this image from the NASA/ESA Hubble Space Telescope.

The Large Magellanic Cloud (LMC) is ablaze with star-forming regions. From the Tarantula Nebula, the brightest stellar nursery in our cosmic neighbourhood, to LHA 120-N 11, part of which is featured in this Hubble image, the small and irregular galaxy is scattered with glowing nebulae, the most noticeable sign that new stars are being born.

The LMC is in an ideal position for astronomers to study the phenomena surrounding star formation. It lies in a fortuitous location in the sky, far enough from the plane of the Milky Way that it is neither outshone by too many nearby stars, nor obscured by the dust in the Milky Way's centre. It is also close enough to study in detail (less than a tenth of the distance of the Andromeda Galaxy, the closest spiral galaxy), and lies almost face-on to us [1], giving us a bird's eye view.

LHA 120-N 11 (known as N11 for short) is a particularly bright region of the LMC, consisting of several adjacent pockets of gas and star formation. NGC 1769 (in the centre of this image) and NGC 1763 (to the right, see heic1011) are among the brightest parts.

In the centre of this image, a dark finger of dust blots out much of the light. While nebulae are mostly made of hydrogen, the simplest and most plentiful element in the Universe, dust clouds are home to heavier and more complex elements, which go on to form rocky planets like Earth. Much finer than household dust (it is more like smoke), this interstellar dust consists of material expelled from previous generations of stars as they died.

Nearly 200 000 light-years from Earth, the Large Magellanic Cloud, a satellite galaxy of the Milky Way, floats in space, in a long and slow dance around our galaxy. As the Milky Way's gravity gently tugs on its neighbour's gas clouds, they collapse to form new stars. In turn, these light up the gas clouds in a kaleidoscope of colours, visible in this image from the NASA/ESA Hubble Space Telescope. (Credit: NASA, ESA. Acknowledgement: Josh Lake)

The data in this image were identified by Josh Lake, an astronomy teacher at Pomfret School in Connecticut, USA, in the Hubble's Hidden Treasures image processing competition. The competition invited members of the public to dig out unreleased scientific data from Hubble's vast archive, and to process them into stunning images.

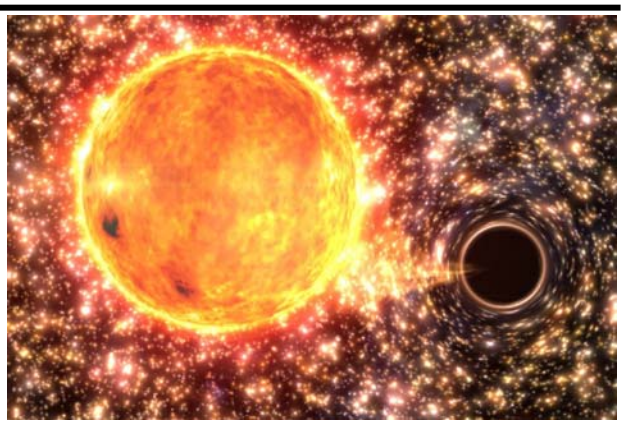
Josh Lake won first prize in the competition with an image contrasting the light from glowing hydrogen and nitrogen in N11. The image above combines the data he identified with additional exposures taken in blue, green and near infrared light.

Science Daily

Black holes growing faster than expected

For years, scientists had believed that supermassive black holes, located at the centres of galaxies, increased their mass in step with the growth of their host galaxy. However, new observations have revealed a dramatically different behaviour. "Black holes have been growing much faster than we thought," Professor Alister Graham from Swinburne's Centre for Astrophysics and Supercomputing said. Within galaxies, there is a competition of sorts for the available gas; for either the formation of new stars or feeding the central black hole. For more than a decade the leading models and theories have assigned a fixed fraction of the gas to each process, effectively preserving the ratio of black hole mass to galaxy mass. New research to be published in The Astrophysical Journal reveals that this approach needs to be changed. "We now know that each ten-fold increase of a galaxy's stellar mass is associated with a much larger 100-fold increase in its black hole mass," Professor Graham said. "This has widespread implications for our understanding of galaxy and black hole coevolution."

The researchers have also found the opposite behaviour to exist among the tightly packed clusters of stars that are observed at the centres of smaller galaxies and in disk galaxies like our Milky Way. "The smaller the galaxy, the greater the fraction of stars in these dense, compact clusters," Swinburne researcher Dr Nicholas Scott said. "In the lower mass galaxies the star clusters, which can contain up to millions of stars, really dominate over the black holes." Previously it was thought that the star clusters contained a constant 0.2 per cent of the galaxy mass. The research also appears to have solved a long-standing mystery in astronomy. 'Intermediate mass' black holes with masses between that of a single star and one million stars have been remarkably elusive. The new research predicts that numerous galaxies already known to harbour a black hole - albeit of a currently unknown mass - should contain these missing `intermediate mass' black holes. "These may be big enough to be seen by the new generation of extremely large telescopes," Dr Scott said. Professor Graham said these black holes were still capable of readily devouring any stars and their potential planets if they ventured too close. "Black holes are effectively gravitational prisons and compactors, and this may have been the fate of many past solar systems," Professor Graham said. "Indeed, such a cosmic dance will contribute at some level to the transformation of nuclear star clusters into massive black holes." The researchers combined observations from the Hubble Space Telescope, the European Very Large Telescope in Chile and the Keck Telescope in Hawaii to create the largest sample to date of galaxies with reliable star cluster and supermassive black hole mass measurements.



Credit: Swinburne University of Technology (Phys.org)—Astronomers from Swinburne University of Technology have discovered how supermassive black holes grow - and it's not what was expected.

Journal reference: Astrophysical Journal search and more info website Provided by Swinburne University of Technology

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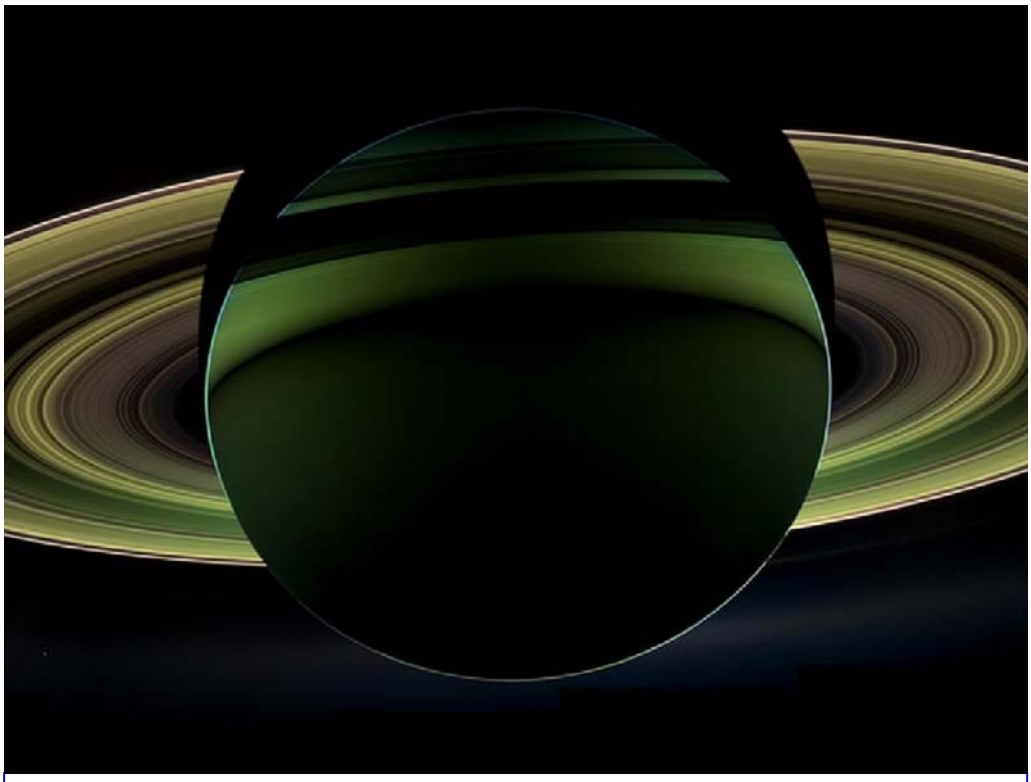
Alien Auroras May Light Up Exoplanet Night Skies

Scientists have kept a close watch on the dazzling northern lights on Earth and other planets in our solar system, but now they have the chance to explore the auroras of alien planets orbiting distant stars, a new study suggests.

Auroras on Earth occur when charged particles from the sun are funneled to the planet's poles and interact with the upper atmosphere, sparking spectacular light shows. Similar processes have been observed on other planets in the solar system, with Jupiter's auroras more than 100 times brighter than those on Earth, scientists said.

Now, scientists are finding evidence of aurora displays on exoplanets for the first time. Researchers used the Low-Frequency Array radio telescope based in The Netherlands to observe radio emissions most likely caused by powerful auroras from planets outside of our solar system.

"These results strongly suggest that auroras do occur on bodies outside our solar system, and the auroral radio emissions are powerful enough — 100,000 times brighter than Jupiter's — to be detectable across interstellar distances," study lead author Jonathan Nichols, of the University of Leicester in England, said in a statement.



NASA's Cassini spacecraft has delivered a glorious view of Saturn, taken while the spacecraft was in Saturn's shadow.
CREDIT: NASA/JPL-Caltech/Space Science Institute

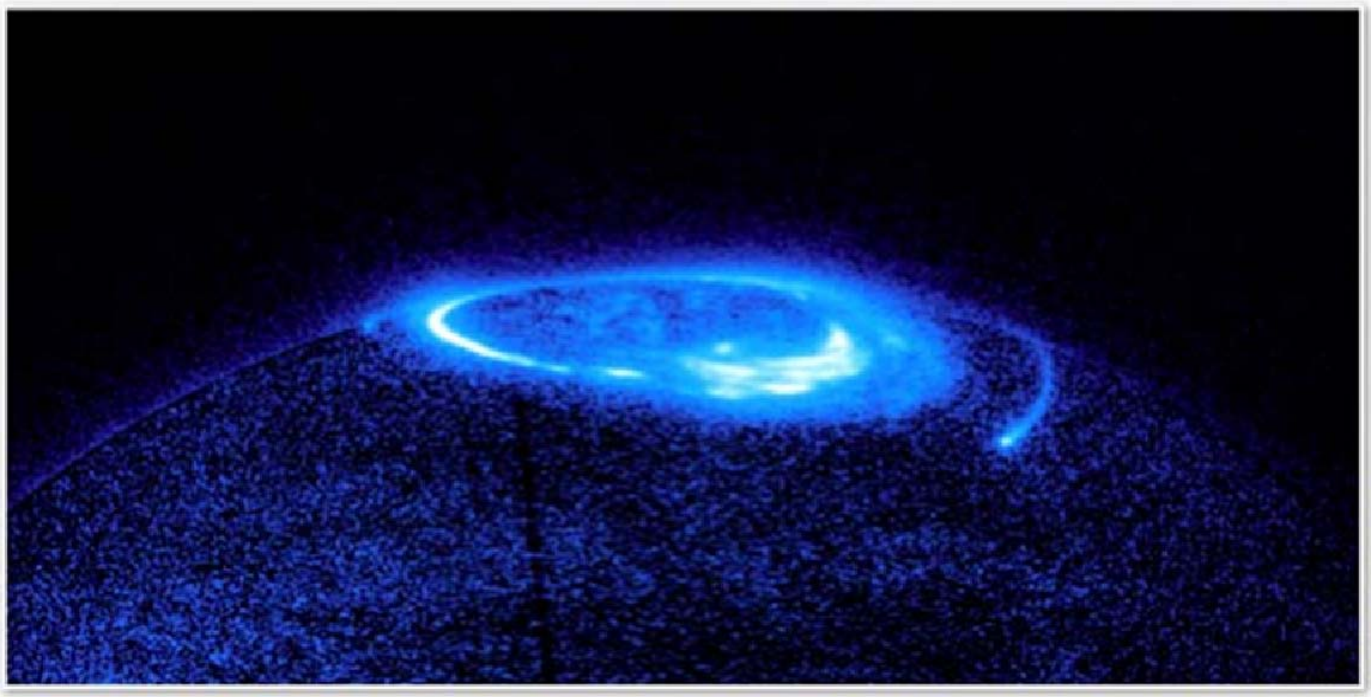
Jupiter's auroras are caused by an interaction of charged particles shot from its volcanic moon, Io and the rotation of the planet itself. The gas giant turns on its axis once every 10 hours, dragging its magnetic field along for the ride, and effectively creating a whirl of electricity at each of the planet's poles.

Auroras akin to Earth's have been spotted on Saturn. But these newest findings show that auroras on exoplanets probably aren't formed from charged particles travelling on the solar wind. Instead, the auroras on the dim, "ultracool dwarf" stars and "failed stars" known as brown dwarfs that Nichols studied probably behave more like Jupiter's northern and southern lights.

By studying these radio emissions, scientists will gain more insight into the strength of a planet's magnetic field, how it interacts with its parent star, whether it has any moons and even the length of its day.

The new research is detailed in a recent issue of The Astrophysical Journal.

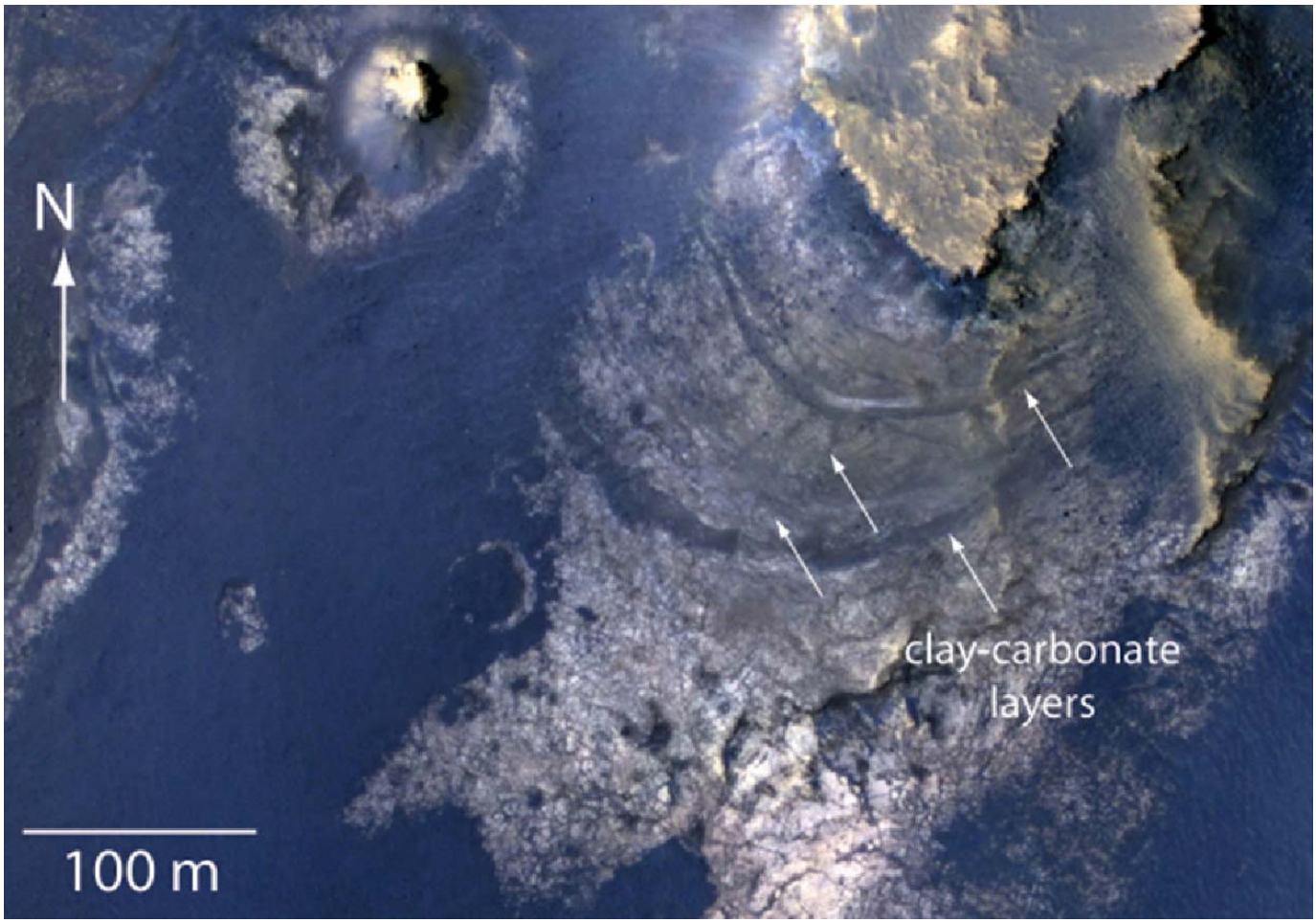
Miriam Kramer
SPACE.com Staff Writer



Images of Jupiter's northern UV auroras were obtained using the Advanced Camera for Surveys onboard the Hubble Space Telescope in February 2007.
CREDIT: Boston University/NASA.

Giant Mars Crater Shows Evidence of Ancient Lake

by Charles Q. Choi, SPACE.com



An annotated look at the huge McLaughlin Crater on Mars, showing locations of minerals and clays created by water in the ancient past. The region may have once been a groundwater lake billions of years ago. Image released Jan. 20, 2013.
CREDIT: NASA/JPL-Caltech/Univ. of Arizona

New photos of a huge crater on Mars suggest water may lurk in crevices under the planet's surface, hinting that life might have once lived there, and raising the possibility that it may live there still, researchers say.

Future research looking into the chances of life on Mars could shed light on the origins of life on Earth, scientists added.

The discovery came from a study of images by NASA's powerful Mars Reconnaissance Orbiter that revealed new evidence of a wet underground environment on the Red Planet. The images focused on the giant McLaughlin Crater, which is about 57 miles (92 kilometers) wide and so deep that underground water appears to have flowed into the crater at some point in the distant past.

Today, the crater is bone-dry but harbors clay minerals and other evidence that liquid water filled the area in the ancient past.

"Taken together, the observations in McLaughlin Crater provide the best evidence for carbonate forming within a lake environment instead of being washed into a crater from outside," study lead author Joseph Michalski, of the Planetary Science Institute in Tucson, Ariz., and London's Natural History Museum, said in a statement. [Search for Water on Mars (Photos)

A wet Mars underground

Space agencies have deployed many missions to Mars over the decades to explore how habitable its surface may have been or is today. However, the Martian surface has been extremely cold, arid and chemically hostile to life as we know it for most of the history of Mars.

Instead of scanning the surface of Mars for life, scientists have suggested the most viable habitat for ancient simple life may have been in Martian water hidden underground.

On Earth, microbes up to 3 miles (5 km) or more underground make up perhaps half of all of the planet's living matter. Most of these organisms represent some of the most primitive kinds of microbes known, hinting that life may actually have started underground, or at least survived there during a series of devastating cosmic impacts known as the Late Heavy Bombardment that Earth and the rest of the inner solar system endured about 4.1 billion to 3.8 billion years ago.

Since Mars has less gravity — a surface gravity of a little more than one-third Earth's — its crust is less dense and more porous than that of our planet, which means that more water can leak underground, researchers said. Wherever there is liquid water on Earth, there is virtually always life, and microbes underground on Mars could be sustained by energy sources and chemical reactions similar to those that support deep-dwelling organisms on Earth.

"The deep crust has always been the most habitable place on Mars, and would be a wise place to search for evidence for organic processes in the future," Michalski told SPACE.com. [Search for Life on Mars: A Timeline (Gallery)]

Subterranean Mars

While researchers currently have no way to drill deep underground on the Red Planet, they can nevertheless spot hints of what subterranean Mars is like by analyzing deep rocks exhumed by erosion, asteroid impacts or materials generated by underground fluids that have welled up to the surface.

Such upwelling would first occur in deep basins like McLaughlin Crater — as the lowest points on the surface, they would be where underground water reserves would most likely get exposed.

Scientists focused on McLaughlin Crater because it is one of the deepest craters on Mars. McLaughlin is about 1.3 miles (2.2 km) deep and is located in Mars' northern hemisphere.

The mineral composition of the floor of McLaughlin Crater suggests there was a lake

(Continued on page 24)

(Continued from page 23)
made of upwelled groundwater there. Channels seen on the crater's eastern wall about 1,650 feet (500 meters) above its floor also hint at the former presence of a lake surface.

Michalski was actually originally trying to disprove the idea that groundwater breached the surface in many locations on Mars.

"Lo and behold, there was strong evidence for that process in this crater," he said. "Science is special because we are allowed to change our minds."

An ancient groundwater lake

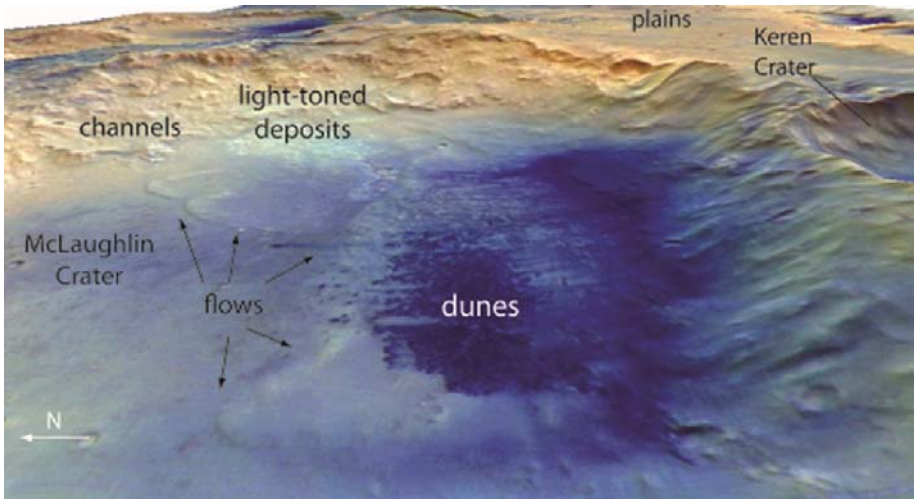
The researchers estimate that a lake existed at McLaughlin Crater for an unknown duration between 3.7 billion and 4 billion years ago. "That makes the deposits as old as or older than the oldest rocks known to exist on Earth," Michalski said.

Mounds seen on the crater floor may have come from landslides or subsequent meteor impacts. These are important because they may have rapidly buried crater floor sediments.

"That is really cool because rapid burial is the scenario that is most advantageous for preservation of organic material, if any was present at that time," Michalski said.

Since life on Earth may have begun underground, learning more about any underground life that might have lived — or may still live — on Mars could shed light on the origins of life on Earth, researchers said.

"We should give serious consideration to exploring rocks representing subsurface environments in future missions," Michalski said. "That doesn't mean drilling, but instead exploring rocks formed from upwelling groundwater, or rocks naturally exhumed from the subsurface by meteor impact."



This color image draped onto digital topography shows McLaughlin Crater in a 3D perspective, looking toward the east. Light-toned deposits on the crater floor contain alteration minerals that are overlayed by debris flows from Keren Crater, present on the south rim. McLaughin Crater once contained a lake that was likely fed by groundwater.
CREDIT: High Resolution Stereo Camera (HRSC)/Mars Express/Freie Universität Berlin

Michalski noted that some people may ask, "'Why do I hear about the detection of water or possibility of life on Mars all the time?' The answer is because Mars is habitable in more ways than we ever realized for many years, and we are finding water in many forms and environments on Mars — many more than we predicted for a long time."

The ingredients for life the researchers describe, "including energy sources, would have been more available early in Mars' history, but it doesn't take too much imagination to picture a scenario in which the subsurface is habitable today," Michalski said. He cautioned, however, "that is much different from saying that life is there today."

The scientists detailed their findings online Jan. 20 in the journal Nature Geoscience.

SPACE.com

GALEX reveals the largest-known spiral galaxy

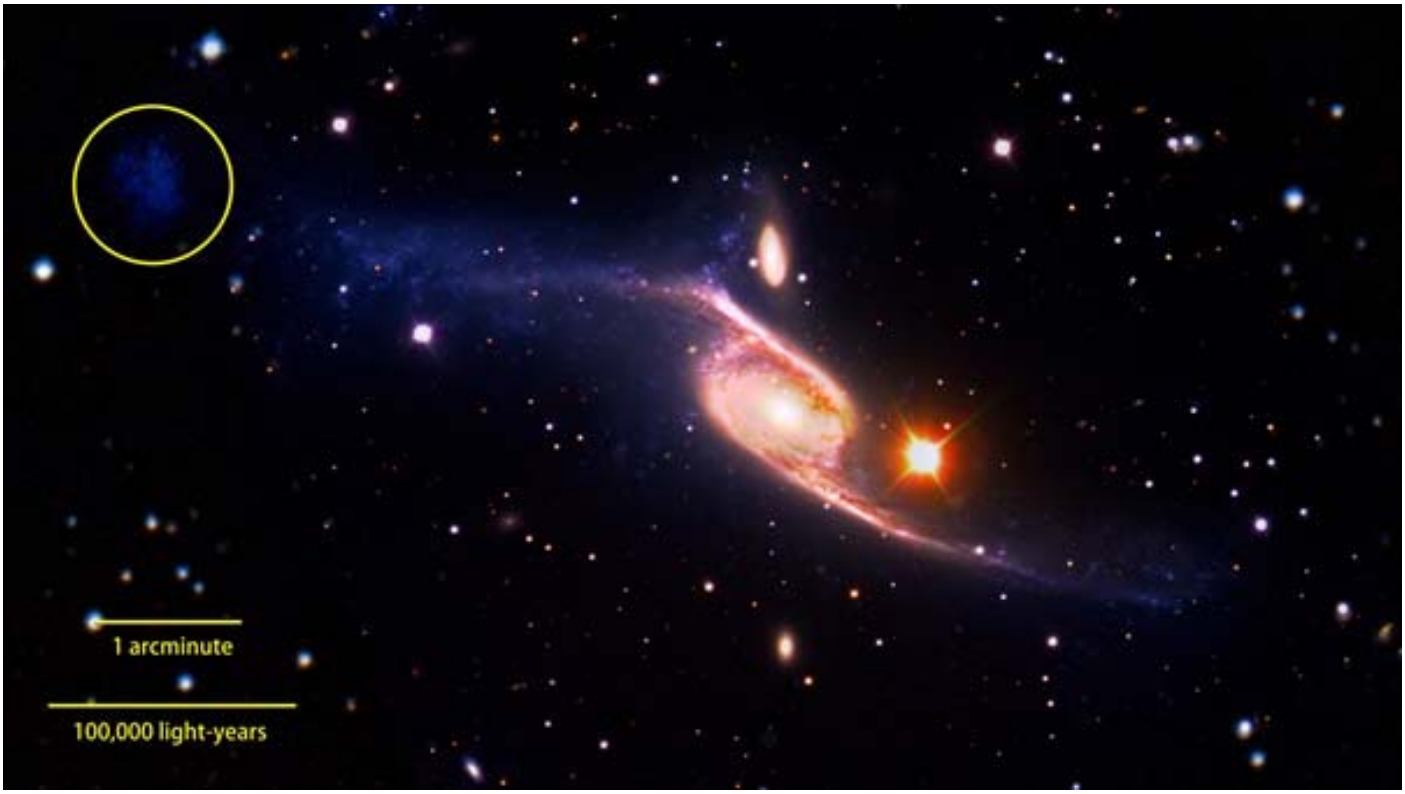
by Francis Reddy

This composite of the giant barred spiral galaxy NGC 6872 combines visible light images from the European Southern Observatory's Very Large Telescope with far-ultraviolet (1,528 angstroms) data from NASA's GALEX and 3.6-micron infrared data acquired by NASA's Spitzer Space Telescope. A previously unsuspected tidal dwarf galaxy candidate (circled) appears only in the ultraviolet, indicating the presence of many hot young stars. IC 4970, the small disk galaxy interacting with NGC 6872, is located above the spiral's central region. The spiral is 522,000 light-years across from the tip of one outstretched arm to the tip of the other, which makes it about five times the size of our home galaxy, the Milky Way. Images of lower resolution from the Digital Sky Survey were used to fill in marginal areas not covered by the other data. Credit: NASA's Goddard Space Flight Center/ESO/JPL-Caltech/DSS (Phys.org)—The spectacular barred spiral galaxy NGC 6872 has ranked among the biggest stellar systems for decades. Now a team of astronomers from the United States, Chile and Brazil has crowned it the largest-known spiral, based on archival data from NASA's Galaxy Evolution Explorer (GALEX) mission, which has since been loaned to the California Institute of Technology, Pasadena

Measuring tip-to-tip across its two outsized spiral arms, NGC 6872 spans more than 522,000 light-years, making it more than five times the size of our Milky Way galaxy. "Without GALEX's ability to detect the ultraviolet light of the youngest, hottest stars, we would never have recognized the full extent of this intriguing system," said lead scientist Rafael Eufrasio, a research assistant at NASA's Goddard Space Flight Center in Greenbelt, Md., and a doctoral student at Catholic University of America in Washington. He presented the findings Thursday at the American Astronomical Society meeting in Long Beach, Calif. The galaxy's unusual size and appearance stem from its interaction with a much smaller disk galaxy named IC 4970, which has only about one-fifth the mass of NGC 6872. The odd couple is located 212 million light-years from Earth in the southern constellation Pavo. Astronomers think large galaxies, including our own, grew through mergers and acquisitions—assembling over billions of years by absorbing numerous smaller systems. Intriguingly, the gravitational interaction of NGC 6872 and IC 4970 may have done the opposite, spawning what may develop into a new small galaxy.

Computer simulations of the collision between NGC 6872 and IC 4970 reproduce the basic features of the galaxies as we see them today. They indicate that IC 4970's closest encounter occurred 130 million years ago and that the smaller galaxy followed a path (dashed curve) close to the plane of the spiral's disk and in the same direction it rotates. Credit: NASA's Goddard Space Flight Center, after C. Horellou (Onsala Space Observatory) and B. Koribalski (ATNF) "The northeastern arm of NGC 6872 is the most disturbed and is rippling with star formation, but at its far end, visible only in the ultraviolet, is an object that appears to be a tidal dwarf galaxy similar to those seen in other interacting systems," said team member Duilia de Mello, a professor of astronomy at Catholic University. The tidal dwarf candidate is brighter in the ultraviolet than other regions of the galaxy, a sign it bears a rich supply of hot young stars less than 200 million years old. The researchers studied the galaxy across the spectrum using archival data from the European Southern Observatory's Very Large Telescope, the Two Micron All Sky Survey, and NASA's Spitzer Space Telescope, as well as GALEX.

By analyzing the distribution of energy by wavelength, the team uncovered a distinct pattern of stellar age along the galaxy's two prominent spiral arms. The youngest stars appear in the far end of the northwestern arm, within the tidal dwarf candidate, and stellar ages skew progressively older toward the galaxy's center. The southwestern arm displays the same pattern, which is likely connected to waves of star formation triggered by the galactic encounter. A 2007 study by Cathy Horellou at Onsala Space Observatory in Sweden and Baerbel



Koribalski of the Australia National Telescope Facility developed computer simulations of the collision that reproduced the overall appearance of the system as we see it today. According to the closest match, IC 4970 made its closest approach about 130 million years ago and followed a path that took it nearly along the plane of the spiral's disk in the same direction it rotates. The current study is consistent with this picture. As in all barred spirals, NGC 6872 contains a stellar bar component that transitions between the spiral arms and the galaxy's central regions. Measuring about 26,000 light-years in radius, or about twice the average length found in nearby barred spirals, it is a bar that befits a giant galaxy. The team found no sign of recent star formation along the bar, which indicates it formed at least a few billion years ago. Its aged stars provide a fossil record of the galaxy's stellar population before the encounter with IC 4970 stirred things up. "Understanding the structure and dynamics of nearby interacting systems like this one brings us a step closer to placing these events into their proper cosmological context, paving the way to decoding what we find in younger, more distant systems," said team member and Goddard astrophysicist Eli Dwek. The study also included Fernanda Urrutia-Viscarra and Claudia Mendes de Oliveira at the University of Sao Paulo in Brazil and Dimitri Gadotti at the European Southern Observatory in Santiago, Chile. The GALEX mission is led by the California Institute of Technology in Pasadena, which is responsible for science operations and data analysis. NASA's Jet Propulsion Laboratory, also in Pasadena, manages the mission and built the science instrument. GALEX was developed under NASA's Explorers Program managed by NASA's Goddard Space Flight Center. In May 2012, NASA loaned GALEX to Caltech, which continues spacecraft operations and data management using private funds. More information: Paper: "Stars and Gas in the Very Large Interacting Galaxy NGC 6872." doi: 10.1051/0004-6361:20066023 "IC 4970 and NGC 6872: Galaxy Collision Switches on Black Hole" (12.10.2009) Provided by NASA's Goddard Space Flight Center

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