

FAS Newsletter

Federation of Astronomical Societies

<http://www.fedastro.org.uk>

FAS 40th ANNIVERSARY CONVENTION

The new Bramall Music Hall at the University of Birmingham, a stunning venue which can hold up to 450 people, is the location for the 2014 FAS Annual Convention and AGM.

It will take place on October 11th 2014 starting at 9.30am, with the FAS AGM scheduled for 2.00pm.

This event, which celebrates the 40th Anniversary of the FAS, is not one to miss! There will be a series of talks by invited speakers as well as a variety of trade stands.

The Bramall Music Building is located in the centre of the University of Birmingham campus, in the Aston Webb building - see accompanying map.

The venue is easily accessible via car or train. The



University of Birmingham has its own train station ('University') which is a short walk from the venue. Alternatively it has easy car access with car parks located around the University or disabled parking right outside the venue. Detailed maps will be provided when a ticket for the event has been bought.

Get your tickets via the FAS website:

For further details, see page 2

FAS 40TH ANNIVERSARY CONVENTION & AGM 2014

WHEN
October 11th, 2014
9.30am - 5.30pm

WHERE
Elgar Concert Hall,
University of Birmingham
Edgbaston, Birmingham, B15 2TT.

SPEAKERS INCLUDE: Prof. Paul Cannon FReng OBE • Prof. Bill Chaplin • Prof. Matthew Angling • Early Career Researchers • More TBA

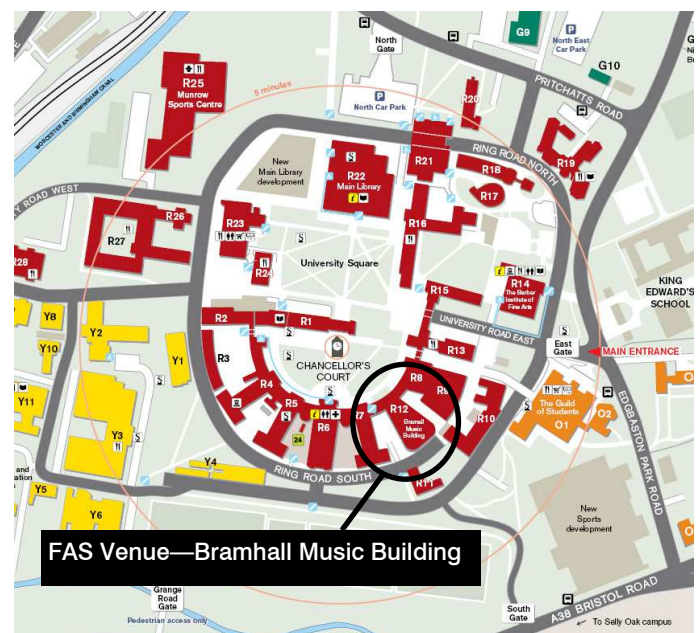
FEDASTRO.ORG.UK/CONVENTION



ADVANCE TICKETS REQUIRED
£5 Member Societies
£7 Non-Member Societies

TRADE STANDS ON THE DAY
Virtual Image Publishing
Campaign for Dark Skies
Explorers Astronomy Tours
and many more to be announced...

EXTRA DETAILS
There are some small shops nearby where lunch can be bought.
You're more than welcome to bring a packed lunch.
For more details check the website.



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PRESIDENT'S SPOT

Now the winter is nearly upon us, it's time to unpack your observing kit from its summer storage and prepare for the observing season ahead.

For societies this is a great time to open your doors to the general public and show them the wonders of the heavens. There are also many groups out there who may also like to visit you, so consider sending a few emails out to community groups in your area and don't forget the schools. Consider offering to go out to venues who may find it difficult to get to you. My own society has arranged to take telescopes out to local country parks, RSPB reserve, English heritage site and several schools. These are a good opportunity to meet the public and make a bit of money to help buy that new piece of astro kit you are always wanting.

All these types of events are very dependent on getting your membership involved, these are

the people who will be speaking to the public and showing them the sky so a group of willing volunteers is a must. Be aware if you have an open house event (ie no pre-booking) you may get lots of people turn up, so ensure you have enough bodies on the ground. Not every volunteer has to be out using a telescope; other volunteers could just talk about general astronomy, direct people to telescopes, run a stall (e.g. book stall) or make hot drinks.

Don't forget the Convention and AGM on 11th October in Birmingham, tickets are on sale now, see the 2014 Convention page on the FAS website for further details. FAS Council is also in need of volunteers so if any of your members would be interested in serving on council then ask them to get in touch. Council normally meets face to face about 4 times per year in London and the rest of the time converses via email.

That's all for now & i hope to see some of you at the convention.

Gary Gawthrope

FAS Convention 2014 Programme

- 9.30: Welcome and Introduction
- 9.40: "Solar Superstorms – a storm in a tea cup, or a global risk?"
Prof. Paul Cannon FREng OBE
- 10.40: Break
- 11.00: "Music of the Stars"
Prof. Bill Chaplin
- 12.00: Lunch
- 13.00: *Small Satellites, Big Ambitions*
Prof. Matthew Angling
- 14.00: FAS AGM
- 14.50: Break
- 15.05: Early Career Researchers
- 16.00: Break
- 16.30: Early Career Researchers
- 17.30: Closing Remarks

FAS Convention 2014

Tickets will be charged at £5 for FAS members and £7 for non-members, and are available via the FAS website - www.fedastro.org.uk.

With regards to catering, there is a Costa Coffee at the venue and within 5 minutes on campus there is a Spar and a Subway. Local pubs and restaurants are 10+ minute walk away.

The venue location details are:

Bramall Music Building, University of Birmingham, Edgbaston, Birmingham B15 2TT.

An Appeal from the Editor

I do not normally make a point of including any form of editorial, but I was asked the other day -

"why do you include so many articles from and about Liverpool Astronomy Society? What about all the others?"

The answer was quite simple, apart from LAS and a very small number of others, I do not hear from the bulk of the 200 or so societies which form the FAS. Now I realise that LAS is probably the largest AS in the UK and therefore has lots of resources, but every society, no matter how small holds star parties, school events, etc., which will be of interest, and possibly instruction to others.

So I am using this platform to appeal to you to send me information about the activities of your societies for inclusion in the Newsletter. News, questions, photographs, or anything else will be gratefully received.

As I will have done 10 years 'at the Newsletter-coalface' this year, I would like to see a significant increase in society contact going forward. So I am sending this appeal to all societies and readers :-

"Let me tell the world about you and your activities"

ASTRONOMY IN PORTUGAL - COAA Visit May 2014

I have never really come to terms with the telescope, taking the view that astronomy is far more than just observing. When I go on holiday I look to try something different; so a four day visit to COAA fitted the bill with the additional benefit of good walking in Portugal where we had never been.

COAA, or to be more precise the Centro de Observação Astronómica do Algarve www.coaa.co.uk/ is 'the well known astronomy holiday centre, based in the Algarve region of southern Portugal, which is designed to give amateur astronomers the opportunity to use larger telescopes under exceptionally favourable observing conditions and to give their families a superb holiday in one of the sunniest corners of Europe.'

It's run by Bev and Jan Ewen-Smith, a British couple who established COAA over 25 years ago. Our visit had been preceded by LAS members and their families such as Rob Johnson, David Forshaw and Tony Williams some visiting as early as the 1990's. Bev has a wealth of knowledge and experience which is freely available to you - he wrote software for the SLOOH robotic telescope. www.slooh.com/

At the time of my visit there were just two visitors observing - all of it was done on the 20" telescope. I particularly wanted to try astrophotography, and had asked Rob Johnson's advice prior to leaving - on the night we used M51 The Whirlpool Galaxy which was almost directly overhead.

A digital SLR camera with a remote digital shutter release and timer was fitted to the telescope eye piece and focussed using a diffraction grating. A guide star was selected through the finder scope and tracked using a webcam and a laptop with tracking software. The digital shutter release/timer was then set for a series of 10 one-minute exposures. The ten exposures were then stacked.

Our observing time by choice, was about 2 hours from about 10pm each evening - it could have been longer but it was the visitors who called it a day each evening; Bev was more than content to continue.

During the day we did three good and varied walks,



about 20 miles in total, all within 30 minutes travel by car. A hill walk up Picota, a coast walk from Luz and a levada walk near Silves. There is a solar scope although it's probably only useful in the mid-morning - alternative day time activities are required.

There are two options for travelling from Faro Airport either a hire car or arrange for a taxi through COAA - I don't think the airport taxis will have a clue how to find COAA. My GPS doesn't find COAA or Poio its hamlet of five houses. I printed out the route on Google maps while in the UK and previewed the neighbouring area on Street View, which worked very well. Once at COAA I set it as 'home' on the GPS and we arrived 'home' uneventfully each evening.

The A22 motorway is now a toll road - although with a little planning I was able to stay away from the tolls, using EN125 which runs parallel and see more of Portugal.

An interesting and enjoyable four days - but I'm still not looking for a telescope.

By Brian Finney
Courtesy: LAS Newsletter



Having spent a great week at COAA, I can recommend it to all amateur astronomers. The chance to use a large reflector under dark skies is really rewarding.

Editor



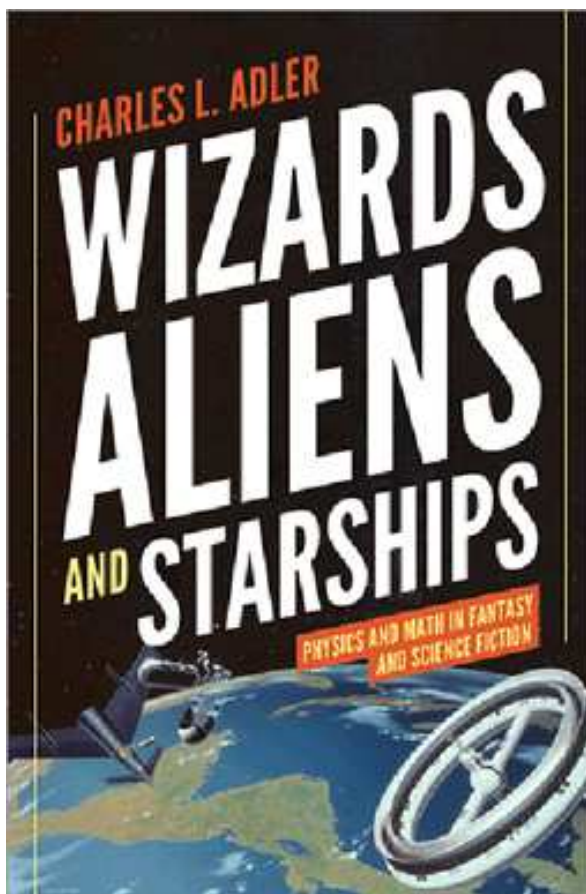
BOOK REVIEWS

WIZARDS ALIENS AND STARSHIPS

by CHARLES L. ADLER Princeton University Press 2014. ISBN 978-0-0691-14715-4 (Hardback)

When pilot of the future Colonel Dan Dare set forth in 1950 with faithful batman Digby, fellow adventurer Hank Hogan and others to explore Venus and other far flung corners of the solar system few, if any, of the 9-year old readers of Eagle were equipped to even ask the question 'Is any of this possible?' We just believed and each week we were eager for more. Seventy-odd years on Charles L. Adler sets out to put this and other records straight. In *Wizards, Aliens and Starships* (Physics and Math in Fantasy and Science Fiction) Adler looks through the eyes of a twenty first century scientist at the fantasy and fiction which fired our imagination during the mid and late twentieth century. The idea is not original, Laurence Krauss having already shattered any illusions we might have had that the Starship Enterprise and other Star Trek wonders were just a matter of a little ingenuity and (not a little) cash. Adler's sights are aimed at a wider target, however, as he delves into the feasibility of a wide range of familiar science fiction favourites – from teleportation and space elevators to alien contact and interstellar travel – and to magic !

The book is in four main parts. Part 1, Potter Physics, looks at the fantastic events and general wizardry of life at Hogwarts. There is an entire chapter devoted to the not so trivial question as to why Hogwarts is so dark. Parts II and III deal with Space Travel and Worlds and Aliens and Part IV, Year Googol, looks at the long term future and survival of the human as well as other intelligent species. Here we find the concepts of Dyson Spheres and Ringworlds. The



spaceflight of Dan Dare is as different to that in Star Trek as that, in turn, is different to the technology of Avatar. Adler gives each the attention and, indeed, the respect they deserve. He also explains why the magic of Harry Potter cannot adhere to the strictures of science and why, forty five years on from Apollo 11, piloted spaceflight is not the commonplace event that once it promised to be. This is then a wide-ranging book.

The author sets out to provide a structured scientific critique of those ideas and concepts which form the basis and backbone to much popular fantasy and science fiction literature. His approach is not to stray too far beyond the A-level science and mathematics curriculum and he sets the stage to encourage the use of his arguments, anal-

yses and conclusions within teaching programmes for these subjects. There is therefore much recourse to Newton's Laws and to fundamental forces (Gravity, Electromagnetic and Nuclear) and these topics are reviewed briefly in an appendix. When the theory is beyond this arbitrary but flexible limit the author quotes the results of more advanced analysis and proceeds to examine the repercussions, for example, of a relativistic treatment. His conclusions are often illustrated with easily understood comparisons – as, for example, by comparing the energy requirements for fast interstellar travel or the construction of a space elevator with the annual energy consumption of the USA. Adler also makes frequent reference to many fantasy and science fiction authors and summarises many key story elements. It is then a well-informed as well as wide-ranging review. There is a comprehensive bibliography and, for those who wish to dip in or look again at a favourite subject, there is a detailed index.

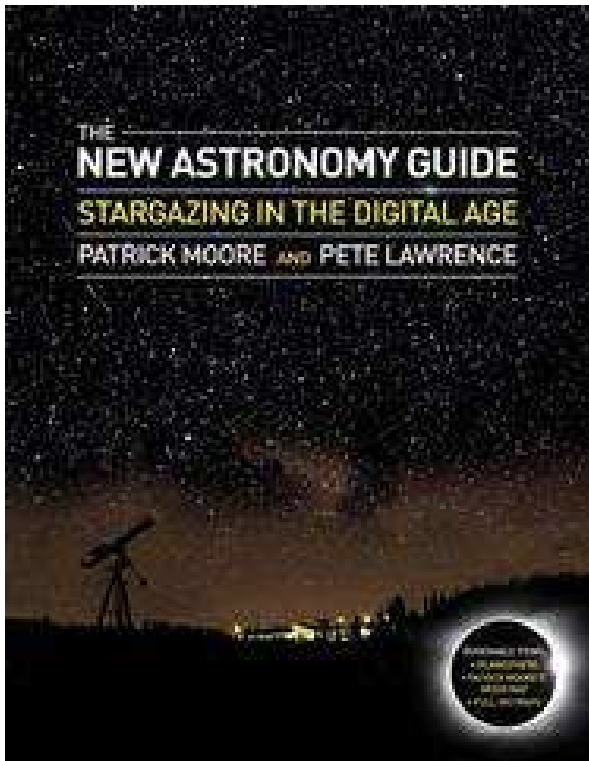
There will be those who might wish to avoid the demystification of the exploits of our personal popular heroes of yesteryear who 'boldly went'. There is equal satisfaction to be gained however through an understanding of why some of science fiction's famous stories conceal a plethora of scientific and technological problems. Charles Adler's book is a good start. In 1950 it might have been easy to 'Open the pod bay doors' but Hal was just a dream. Adler's book is in no way anti-dream and his enthusiastic trip through those open pod bay doors has much to recommend it.

Brian Parsons.

The New Astronomy Guide - Star Gazing in the Digital Age

Sir Patrick Moore and Pete Lawrence

Carlton Publishing Group ISBN: 9781780970646
£20.00



With authors of the stature of Pete Lawrence and the late Sir Patrick Moore, this book is sure to be of great interest and usefulness to the amateur astronomy, specially those who hanker after producing images of their endeavours.

The first two-thirds of the book covers phenomena related to the earth's atmosphere through the Solar System and then to deep sky. There are also a couple of sections on photography generally and telescope selection. With each of these the coverage is quite comprehensive and should be of great benefit to those starting out and also to those wishing to upgrade their set-ups.

The final third consists of a series of star charts covering both northern and southern hemispheres with each chart representing a three-month period.

In addition, in a pocket on the inside of the rear cover are a couple of separate pull-out charts. One is a large reproduction of Sir Patrick's Moon Map and the other is a two-sided large map of the night sky.

This book is in a fairly large format and as such could be treated as a 'coffee table' publication, where the casual reader will find many things of interest. It however has a wealth of detail and could form the book of reference and instruction for the beginner and developer in astronomy. Further, it should also provide a source of useful information for the more experienced amateur astronomer. Pete Lawrence has done a great job of outlining the many aspects of imaging and the many types of target to photograph, and even seasoned astro-imagers should find something to extend their field of interest.

It is a moot point, whether the book is enhanced by having all pages of sky charts, because one is unlikely to take it outside into the night sky. However, it is useful to be able to look up the actual location of a night sky feature that you are reading about in the earlier pages.

On balance this is an excellent publication and one which many will use it as a first point of reference.

Frank Johns

The Cosmic Tourist

Sir Patrick Moore, Brian May and Chris Lintott

Carlton Publishing Group ISBN: 9781847326195 £25.00

The theme of this book, a follow-up to their successful 'Bang', is encapsulated by the light-hearted cartoon on the cover, which shows the three authors suitably clothed in space-suits, aboard the spaceship Ptolemy, as they embark on a tour of the cosmos. Whilst this image is humorous, the content of the book is serious, but never becomes po-faced about it.

Incidentally, their spaceship is named after the late Sir Patrick Moore's cat.

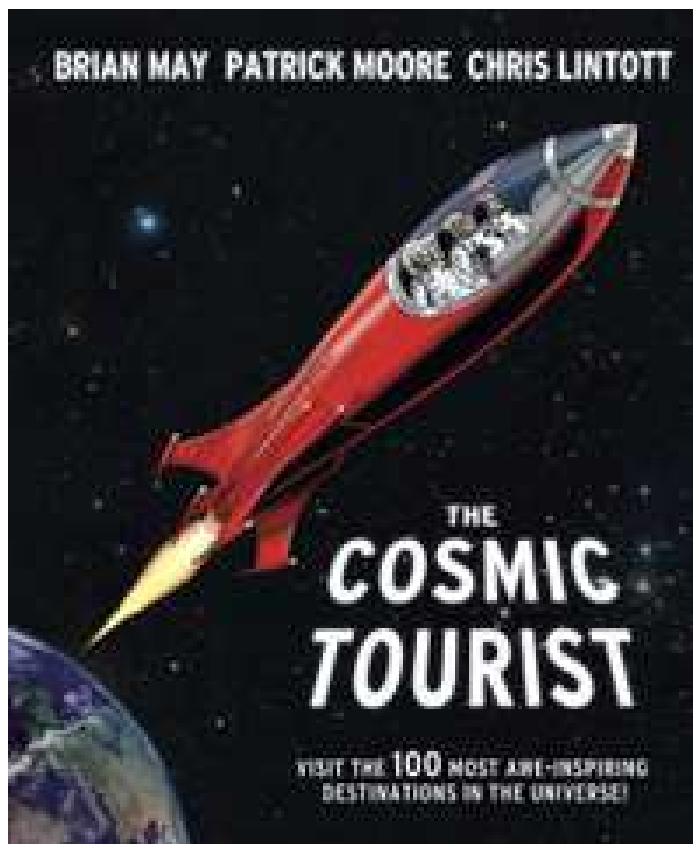
As explained in the briefing notes, the reader is invited to join them on a *'unique journey - to be a tourist on a scale never before imagined'*.

The journey takes the form of visiting and describing 100 locations within the universe, starting with our own planet, Earth. At each stop the distance in light-time back to Earth is given alongside many facts and some stunning photographs.

With Chris Lintott one of the authors, the phrase galactic zoo comes to mind, and with his help many of the sights at each location are explained and, where applicable, how things both familiar and more strange fit into the overall scheme of things.

Obviously all the planets are well covered, but so are asteroids, planetary moons, as well as many of the more prominent deep sky objects from the boundaries of the Solar System taking many stops before getting to the Echoes of the Big Bang.

Much of this information can, of course, be found in other publications, but that would probably mean digging through a number of books. Here it is all in one, and with the experience



of the authors, the reading is easy and enjoyable.

It is worth putting on the bookshelf - or the bedside table, to dip into from time to time. With 100 sections, there is always something fresh to find.

Mike Quest

An Evening with Sy Liebergot

Apollo 3 ..For us flight controllers the mission was a success....”

By Gerard Gilligan.

Over many years I have been very lucky to meet many people who have had some direct involvement in NASA’s Apollo Moon landing program. At the end of June I was given the opportunity to meet and hear someone who had direct involvement, along with many others, in returning the crew of Apollo 13 safety back to Earth in April 1970. Following the spacecraft explosion on the outward journey to the Moon, this put an end to the planned moon landing and almost to the lives of the three Apollo crew.

Seymour (“Sy”) Liebergot, now 78 years old, is a retired NASA flight controller, and served on several Apollo moon landing missions, Skylab missions, and the joint Apollo-Soyuz Earth orbit mission or ASTP in 1975. He told his own story, that as an EECOM controller during the Apollo program; he was responsible for the electrical and environmental systems on board the Command, and Service Module. He was part of the Apollo 13 “white team”, which was just about to hand over to a new shift of controllers when the explosion accrued. The crew, Lovell, Haise, and Swigert, were 55 hours into the mission, and 200,000 miles from Earth, at a point where the spacecraft was under the gravitational influence of the Moon, and accelerating as they closed in.

Following a TV broadcast from space, which was not broadcast live by any America news networks, the crew was asked to do some “housekeeping” items before they retired for a sleep period. It was Sy who asked the flight director Gene Kranz, to request the crew to “stir” the four cryogenics tanks, this to prevent false readings later in the mission. In the weightlessness of the space these tanks held a very dense fog, and not a liquid, but prior to taking a quantity reading, two small fans were switched on in each of the tanks. When Command module pilot Swigert flipped the four switches, obviously no one knew that the wiring inside Oxygen Tank 2 was charred, cracked and bared. A spark in the wiring ignited a fire that caused the tank to explode.

During his lecture, held at The Heath Business Park Runcorn, Sy explained in great detail, and indeed in an uncomplicated way, for those non-engineers in the audience, what had happen. How, over many hours and days, the team of controllers, plus engineers “worked the problem” in keeping the astronauts alive in a crippled spacecraft with effectively oxygen levels for a crew of two for two days, when they need oxygen for a crew of three and for four days. Again it was Sy who realised that to have any chance in getting back to Earth the crew would need to get into the Lunar Module, (code name Aquarius), and use that as the life boat. The Command Module, which was the main spacecraft in keeping the crew alive, was now classed as dead. The engineers had to re-write flight plans, op-



erational manuals and procedures in hours, which had taken many years to prepare. One of those engineers who are now part of manned spaceflight history, along with the astronauts was Sy Liebergot.

More details of the rescue, and safe return of the Apollo 13 crew can be read in Sy Liebergot’s book and autobiography “**Apollo EECOM - Journey of a lifetime**”, which is co-written with David m. Harland. There is also my own article on the events in April 1970, which can be read in the April 2010 issue of the LAS newsletter. (Free to all paid up members of the LAS.)

A very enjoyable evening for myself and several other Liverpool AS members, including Dave Galvin, and Jim Stacey, plus 100 others. It is with great thanks to the partnership of the Knowledge Observatory and Something Astronomical, The Grange School and The National Schools Observatory, the evening and later book signing was able to take place, and just for a few hours we were transported back in time to re-live a truly astonishing story.



I’m sorry but to end, this is from Sy’s excellent book. A Horoscope for Aquarius (LM) from the Houston Post newspaper on the day of the Explosion, April 13th 1970 which indicated:-

“Do surprises turn you on? Then this is the day of the unexpected”

Courtesy: LAS Newsletter

Sun 'n Stars over Cornwall

Observing with the National Trust at Carnevas

Once again Kernow Astronomers and the National Trust were blessed with fairly clear skies for the third of its four **Sun 'n Stars** events at Carnevas (Bedruthan Steps). This Dark Sky Discovery Site has become the outreach observing site of choice for our society.

In addition to various scopes fitted with white light solar filters, this time we were able to demonstrate the much greater solar detail as provided by our newly acquired Lunt H-alpha scope. This scope was acquired as part of our outreach programme to local schools and the funding for it came from a local trust fund and we, the schools concerned and the general public have Kate Mullard and her family to thank for this opportunity.

We set up on site about 2 hours before sunset allowing views of the setting Sun.



Sandi Edwards setting up the solar projector

spots and prominences. With a fair amount of cloud around, detailed observing using the solarscope, meant dodging the clouds, as it does require full sunlight to see the detail.

The Moon was observable just before sunset, although the with poor contrast, and this slowly improved as it got darker.

There was quite a contest to spot the first star or planet that became naked eye visible. Mars was the first followed soon after by Saturn.

Over 100 members of the public both holiday visitors and locals came along through the evening and there was much 'wowing' to be heard, when people young and old saw the Moon draters through a scope for the first time.

In addition to our normal array of telescopes, this event saw the 'launching' of the new 12 inch reflector made by club members.

All in all, a good event.

Mike Thompson



Looking at the early crescent Moon

These events are times to coincide with an early Moon allowing it to be observed during the dusk period whilst waiting for the skies to darken sufficiently to see the planets and the rest of the night sky objects.

Unfortunately whilst the weather was quite warm, there was a strong wind blowing, and so the members of the National Trust in attendance were reluctant to erect the marquee, in which we usually ran a film show. We quite understood this decision, as none of us wanted to 'go fetch' the tent from the bottom of the towering cliffs, if it blew away!!

The Sun was quite active with a significant number of sun-



First light through the newly made 12inch Dob



Waiting for clouds to move off the Sun

The Big Bang Fair North West Aintree Racecourse, Liverpool

This event was a first for the North West region, and organised by STEM Merseyside. It was estimated that over 3,000 school students and their teachers attended from schools as far away as Lancaster, Blackpool, and Manchester. But also from local Liverpool, Sefton, and Wirral schools plus sixth form collages.

The Liverpool Astronomical Society was one of over 50 organisations and educational institutions to taking part.

Together with representatives from major industrial companies and Universities, show casing scientific research in Biology, Chemistry, and Physics for the up and coming scientists. It was both an educational and fun day, with lots of interactive games, and quiz's, but also an opportunity for



Liverpool AS Junior Representative, Jodie Walker talks Astronomy With visitors to the Society display.
Image © 2014 Steve Southern



© STEM Merseyside Image

some schools to display their own science projects, with points awarded and prizes given.

Sadly for the LAS, safe and supervised solar observations with white light & PST telescopes could not take place due to cloudy weather, which only improved near the end of the day's events. But nonetheless the LAS had 250 visitors alone, with contact and "networking" made with many students and teachers who indicated they wish to know more about the Society, its events and activities, but also the great science of astronomy.

A great day, so here's to next year, when we hope to do it all again, but with better weather ©

With thanks to Steve Southern, Jodie Walker, Dave Owen and Geoff Regan, IBM, and the STEM Merseyside team.

Report by Gerard Gilligan.

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Tanabata Festival By Brendan Martin

Liverpool AS were ask by The Conservation Volunteers if we would like to take part in the Japanese Festival of Tanabata to be held at the Liverpool Festival Gardens the weekend of 10-12 July.

We duly arrived with our solar telescopes on the 12th to beautiful sunshine but unfortunately it did not last too long before the dreaded clouds rolled in.

Tanabata, or the Star Festival, is held on the evening of 7 July throughout Japan. The festival traces its origins to a romantic legend that the Cowherd Star (Altair) and Weaver Star (Vega), lovers separated by the Milky Way, are allowed to meet just once a year on the seventh day of the seventh month.

People, especially children, write their wishes such as "I want to become good at football" or "I want to become an astronaut" on narrow strips of coloured paper called tanzaku and hang them, along with other paper ornaments, on bamboo

branches placed in the backyards or entrances of their homes.

They then pray hard in the hope that their wishes will come true. Towns and cities take on a festive mood during the Tanabata season, with colorful decorations. Special events and concerts based on the Tanabata legend are held at places like science museums and planetariums.



Courtesy: LAS Newsletter

International SUN day

Members of Liverpool AS supplied a forest of solar telescopes to take part in International SUNday on June 22nd. A world wide celebration of our nearest star.



The day was hot and sunny, but the odd cloud did get in our way, but conditions did improve during the afternoon.



The event held at the Society's Leighton Observatory, Pex Hill, Cheshire attracted almost 75 visitors, who were given the opportunity to look at the surface of the Sun, safely using white light and hydrogen alpha filtered instruments.



Visitors also enjoyed tours of the observatory, views of the bright planets and stars in daylight, advice about telescopes and astronomy in general, and how to become more involved in the great science of astronomy.

They also enjoyed some light refreshments, which included some star cakes, and what look like fried egg cakes but are in fact the Sun in Hydrogen Alpha. Made by the wife of society member Peter Rae.

We thank all our visitors, and members of the Liverpool AS who brought along their own solar instrumentation. The daytime event was followed by a telescope advice workshop.

An excellent day all round.

By Gerard Gilligan

Courtesy: Liverpool AS Newsletter



Images by Alan Dennett, Jim Stacy and Gerard Gilligan.



Ascension Island by Grant Privett

Ascension Island is not a place well-known as a site for astronomical observation. In fact, it's simpler to say, Ascension Island just isn't a place well-known at all. With the exception of providing the staging point for the Vulcan 'Black Buck' bomber mission during the Falklands War, it's a fairly sleepy little island. These days it's better known as the second largest breeding site of atlantic green turtles, a good diving/ fishing location and home to tens of thousands of Sooty Terns.

Having visited it on business a few years ago, I realised it would be a fascinating place to spend some time as a tourist and so, after some discussion with my wife, we booked a holiday there. It's a slightly more complicated expedition than a package trip to Majorca, because the only airline flying there is the RAF who sell 10 seats a flight to civilians. So, as you might expect, there are more passengers in camouflage gear than usually encountered on Thomons — and the in-flight film selection is rather limited, but at least there are always second breakfasts on offer.



The flight there follows a simple route, out round Spain, down to the Canaries and then straight on south over the South Atlantic for five more hours, hanging a right near the end. There, 1000 miles west of Africa and 2000 miles east from Brazil, you find a six-mile wide lump of volcanic rock that's one of the UK's last remaining Overseas Territories.

Upon disembarking from the plane you find yourself on a long runway (it was an emergency landing site for the Space Shut-

tle) surrounded by cinder caps and with the 890m dormant volcano known as Green Mountain not far inland. The volcanic nature of the place is very obvious and the expertise of the pilots landing there has to be admired. However, landing at 7.00am after an overnight flight, I was more inclined to such thoughts as: "*Where's me bed?*".



We had booked one of the only two self-catering bungalows on the island (there's one hotel) for two weeks. The accommodation was plain and in need of a little repair work (the nearest B&Q is, after all, a long flight away, so maintenance must be difficult), but adequate and certainly easily big enough for the two of us. Better still it was off near the edge of the vast sprawling metropolis of Georgetown (pop. <400) which is the Island's capital. The view of the sandy beach 20m below us and blue sea 80m away was icing on the cake - it made up for the lack of aircon and the mossies, who quickly developed a great enthusiasm for biting my hands and nose during my nights outside.

Obviously, during the days we played the tourist (it was 26-29°C the whole time we were there) and visited pretty much all there was to see - the turtles are really memorable - before settling in to a nice relaxing routine of sitting under the verandah and watching the waves roll in from South America. There's little indigeous wildlife; though the land crabs can make a row if they decide to walk on a metal roof, the donkey community occasionally have an all-hands braying contest at 03:30 and the rabbits are carnivorous - eating cockroaches when times are hard and the grass is all shrivelled. And we were glad of the rabbits and their sharp pointed teeth: one 'roach alighted on a table next to me one night and was as long as a cigarette packet. A rich russet colour. Quite impressive, but not something you want running over your feet or climbing up your back

The nights however, were pretty good.

Let's be honest, I have seen darker skies: the sky from high on La Palma and from the deep desert (Muadib) of Southern Australia have an edge. In fact, even a very good night from the St. David's in Wales is quite similar in darkness (well defined mottling in the Milky-Way coming down to 5° above the horizon) and this is probably due to the 70-80% humidity on the island while we were there. But what Pembrokeshire and the Canaries lack is the Southern Cross, Carina, Centaurus and the Magellanic clouds well placed. Ascension gives you the chance to see a large chunk of the night sky - both north and south - and the opportunity to directly compare M13 with Omega Centauri (for those curious, it's no contest, M13 is very much the poor relation).

Each night the sunset into the sea and the visibility was spectacular. The local Met. Office station generally records it as having a visibility greater than six miles merely because there is no landmark further away for them to use as a reference. However, the horizons are generally razor sharp, so we were quite pleased to see the green flash, not once, but four times.



The next thing we were impressed with was how fast the sky got dark. On one occasion we noticed that Jupiter was visible and obvious to the naked eye within two minutes of sunset. Indeed, Capella was visible within four to five minutes. The sun goes down (right to left) very steeply and there's no messing about, with astronomical twilight done and dusted in about seventy minutes. I stepped outside one evening to have a look before we ate - it's pretty much a twelve-hour night - and was impressed to see clouds silhouetted against the diffuse glow of the Zodiacal Light reaching up from the horizon and along the plane of the ecliptic. The Light was very difficult to photograph (though I had a go - only partially successful) and lacked the detail of the Milky Way, but was nonetheless obvious - even more so on a night when it was partially cloudy.

On another occasion I went down to a local beach to photograph the sky and spent some time ignoring part of the sky near the southern horizon because of a patch of cloud I thought was being generated by the mountain inland. It was, in fact, the Large Magellanic Cloud. Suddenly, the choice of name was obvious and very apposite. Unfortunately, it was pretty low in the sky and didn't photograph well, but it was good to be reminded that it's big and easy to pick out hints of structure with the naked eye.

After that I was renewing my acquaintance with the southern constellations. Most are not difficult to learn, though Centaurus does sprawl a bit and it is obvious why the IAU chose to break up Argo Navis in 1930. It was enormous. As before, I found that my favourite bit of the Milky Way runs from Orion down through Canis Major, Carina, Crux, Centaurus and onward into Scorpius and Sagittarius. It's a lovely sight. Bright stars, rich Milky Way and some stand-out deep sky objects (M41 was obvious to the naked eye). The large number of bright stars in a small region helps too.

The sky isn't ideal from Georgetown due to some low-pressure Sodium street lights, and locations near the airfield can be very bright (and actually very pretty in a 'Christmas tree' sort of way) when there's a plane on the ground. Similarly, the airbase sportsfield can be irritating when in use at midnight, but when things are turned off and the Moon is out the way, the old adage about not being able to see your hand in front of your face is true. I got some very nice views of the Milky Way from elsewhere on the island - but given its size, everywhere you might observe from is within a 30-minute drive.



On this trip I didn't have space for binoculars, but I did manage to arrange to borrow a telescope while on the island for a couple of a few days. I had intended to have one night imaging and a second night browsing the deep sky in detail and recording details. Unfortunately, for a variety of reasons, not least some highly atypical weather, the second night never materialised, but I did get several hours of imaging

and managed to go all the way through to sunrise the next morning - gaining several



additional mosquito bites along the way.

I had intended to photograph the turtles with a night sky above, but during the dark of the Moon, the sky gave so little light that they couldn't be seen and flash photography of the turtles is forbidden as it confuses their sense of direction. Confusing them endangers their lives and is not popular with the volunteers who spend their mornings trying to drag 300kg turtles off the football pitch, car park or road and pointing them back toward the sea. On some nights, four hundred come ashore at Long Beach, so it's no joke. Especially as turtles appear to have a 30-second attention span. If they spot you nearby they get frightened and panicky in a bovine sort of way. Once you stand still, they gradually forget you are there, only to panic again if you move. Given their goldfish-like intellect and the fact they are apparently one of the nicest-tasting meats known, its surprising they have survived at all.

The scope I borrowed for a day or two was a Meade 200mm SCT on an alt-az mount, an LS-8, which limited my CCD exposures to 30s. Many of the images captured were indeed trailed, but I managed to get something, cursing only slightly at the intermittent mains voltage/ frequency variation that really messed up many of the shots with the Starlight camera - it didn't happen normally, I was told later. The seeing wasn't brilliant, but certainly wasn't bad. Saturn looked very still and pretty - but measurements suggested a FWHM of the order of 3 arc secs - in the direction of Green Mountain.

Between images I simply gawped at the sky, worked my way through a tube of Pringles (essential astronomical equipment) or spread more Autan on my hands (not that it helped - but I felt that at least I was making an effort to remain bite-free). There were periods of cloud, but most nights had some clear periods. During the months December-March the chance of a good clear sky is higher at about 66%.

Anyway, with the telescope, I hunted down a number of objects. Eta Carinae,

Caldwell 109 (just because it's the most southerly and thus this was likely to be my only chance), the Jewel Box, Trifid Nebula, Centaurus A and Omega Centauri. All are fine sights and image really easily. Especially Eta Carina. It's big, it's bright, it's beautiful. The highlight for me. I've seen it before in a telescope and do like it. I gave most of the objects half an hour or so, throwing away the poor images and keeping those that were good enough. The LS-8 was very handy as it allowed me to quickly find anything I wanted and the field of view of the Starlight H18 was easily big enough when using the f8 LS-8 with an Antares focal reducer.

As mentioned, I did have some problems with the mains, on some portions of the sky the tracking wasn't very good, there was a patch of cloud caused by Green Mountain that came and went and the humidity was uncomfortably high. Australia has better skies and is drier, but it also has 7/10^{ths} of the worlds most dangerous snakes and spiders and requires a much, much longer flight.



All in all, it was a memorable night out with a telescope, especially with Saturn, Mars and Jupiter all well-placed along the way - I even imaged Saturn. The night was briefly derailed by a large crab turning up shortly before midnight and sitting on the verandah (I didn't want to tread on it - the claws were impressive) but things mainly went well. I eventually clambered under the mosquito net to get some sleep at about 0815 after watching the last of the night's turtles returning to the sea after laying. My first astronomy all-nighter since I slipped a disc more than a year ago.

I've no idea when I shall see the southern sky again. I do hope to visit New Zealand one day, perhaps in the next few years, and see a really dark sky again and look upon the Magellanic Clouds when they are high in the sky. If you ever get the chance to go south, whether with telescope, binoculars or without, just grab it.

Courtesy: Hermes - Shropshire AS

East Riding Astronomers at Dalby Forest Star Fest 2014

In 2009 I'd recorded 4 observations around the end of August, the best of 7 years. So this year of 2014 could not fail to be a clear skies Bank Holiday weekend.

Well, the first consideration was that by setting off with fellow member, Mike Fratson, after an early breakfast and with the weather on punt, you have to waste a night at home's observing. No, this wouldn't be frustrating to observers who live under the bright lights anyway, including the host society of Scarborough and Rydale.

The over all impression for me was that it mirrored an essay I had to write at the age of 10 about the day in the life of an umbrella. When it rained my umbrella was sheltered under a shop doorway to keep it dry. During the one night at Dalby we came for, whilst Mike and I were observing between 2330 and 0330 BST, we couldn't see one pitch that wasn't inert and many sheltered three legged scarecrows, some with arms raised in anger, others with a big fist stuck out in front, from the starlight, with fearsome black hoods, whilst the occupants slept.

For ourselves, the only blot on our complete enjoyment was that Mike's knowledge of camping was total Hi-de-Hi. Alas, nothing much was provided for the *cammpers* here, stated on the form, but there was just room for two in my tent and I'd brought plenty of tea and coffee, water, gas stove and full house breakfast for one and Mike did have a sleeping bag.

After borrowing tent pegs and first putting the tent up inverted we settled down on Adderston Field. At 4pm it started raining on and off. There was a good talk in the trade marquee from 8 to 9pm, which surprisingly didn't end with the good forecast of rain before 7 fine by 11; clearing after 2200 UT. It was still raining and overcast at 9-15pm so we dived into our sleeping bags fully clothed, surrounded by increasingly mild merriment. At precisely 2215 UT I was woken by my waterworks alarm. Soon we began 4 hrs observing with Mike's 9.5" Schmit-Cassegrain and my 8" Wise-Newtonian. Yes, the night sky became stunning by midnight BST particularly the Great Bear, but we had once seen the Milky Way better at Weaverthorpe, so nearly mag.6. From 0130 UT our interests had to gradually move NEwards as high cloud crept over.

Seven objects, were observed, ϵ Draco for its vanishing B star, Cat's Eye Nebulae, NGC 7789, M27, M2, M74, M39, a comet in Cass. with binoculars, failed to see 16 Vulp and the Veil Nebulae again and casually saw many Persid like meteor streaks, just one answering to the bright yellow slowish Alpha Capricornids.

Would we go again? Scientifically I counted 15 or 16 stars in faint M71, 20 at home on 28.9 13 over a longer period in 5.6 limiting magnitude. With a young family or other interests as well, 'Yes,' for the good fully sheltered camping field with Porter Co's loos a plenty, a tap and £37 for 4 nights, £32 for 1 to 3 nights per tent, £25 for extra cars. For £20 a night with unknown night sky quality and proximity to Thornton-le-Dale and other diner places, you could be tempted by electricity at all pitches with free fridge and fan heater at Warren House Farm which is above Allerston.

If this has steered you towards talks the East Riding has HERAS in Hull University. For a fixed observatory there's Brough AS's 14" Meade in the Blackburn Welfare grounds.

By Peter Clark

NOTICE

Leeds Astronomical Society Astromeet 2014

The Leeds Astronomical Society's annual

Astromeet takes place on
Saturday 8th November 2014
at

The Clothworkers Hall
School of Music
University of Leeds
LS 2 9JT.

We will have eminent speakers, trade stands and society stalls there.

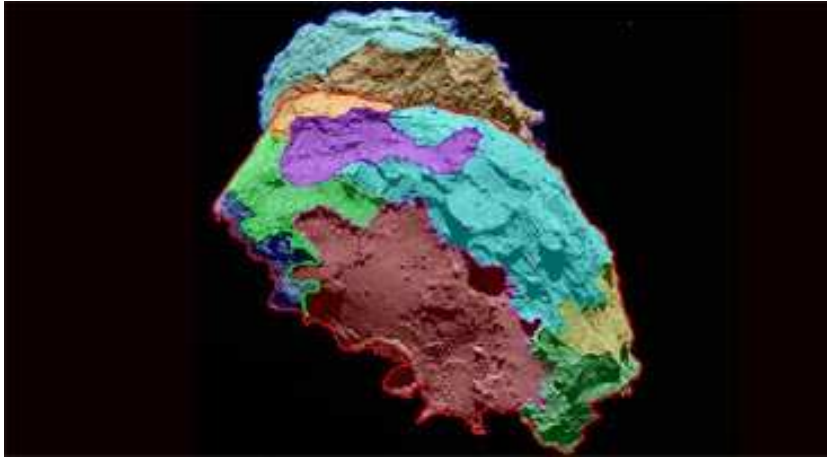
Doors open at 9 am Meeting is 10 am
- 5pm

Contact: Robert Lewis

Email: rockpilot2002@yahoo.co.uk



First map of Rosetta's comet



This view of the "belly" and part of the "head" of comet 67P/Churyumov-Gerasimenko indicates several morphologically different regions.

Credit: ESA/Rosetta/MPS for OSIRIS Team/MPS/UPD/LAM/IAA/SSO/INTA/UPM/DASP/IDA

Scientists have found that the surface of comet 67P/Churyumov-Gerasimenko -- the target of study for the European Space Agency's Rosetta mission -- can be divided into several regions, each characterized by different classes of features. High-resolution images of the comet reveal a unique, multifaceted world.

ESA's Rosetta spacecraft arrived at its destination about a month ago and is currently accompanying the comet as it progresses on its route toward the inner solar system. Scientists have analyzed images of the comet's surface taken by OSIRIS, Rosetta's scientific imaging system, and defined several different regions, each of which has a distinctive physical appearance. This analysis provides the basis for a detailed scientific description of 67P's surface. A map showing the comet's various regions is available at: <http://go.nasa.gov/1pU26L2>

"Never before have we seen a cometary surface in such detail," says OSIRIS Principal Investigator Holger Sierks from the Max Planck Institute for Solar System Science (MPS) in Germany. In some of the images, one pixel corresponds to a scale of 30 inches (75 centimeters) on the nucleus. "It is a historic moment -- we have an unprecedented resolution to map a comet," he says.

The comet has areas dominated by cliffs, depressions, craters, boulders and even parallel grooves. While some of these areas appear to be quiet, others seem to be shaped by the comet's activity, in which grains emitted from below the surface fall back to the ground in the nearby area.

"This first map is, of course, only the beginning of our work," says Sierks. "At this point, nobody truly understands how the surface variations we are currently witnessing came to be."

As both comet 67P and Rosetta travel closer to the sun during the next few months, the OSIRIS team and other instruments on the payload will monitor the surface to look for changes. While scientists do not expect the borderlines

they have identified for the comet's different regions to vary dramatically, even subtle transformations of the surface may help to explain how cometary activity created such a breathtaking world.

The new comet maps will offer valuable insights for members of the Rosetta team, who plan to gather in Toulouse, France, on September 13 and 14, to determine a primary and backup landing site from five candidates they previously had selected.

The scientific imaging system, OSIRIS, was built by a consortium led by the Max Planck Institute for Solar System Research (Germany) in collaboration with Center of Studies and Activities for Space, University of Padua (Italy), the Astrophysical Laboratory of Marseille (France), the Institute of Astrophysics of Andalusia, CSIC (Spain), the Scientific Support Office of the European Space Agency (Netherlands), the National Institute for Aerospace Technology (Spain), the Technical University of Madrid (Spain), the Department of Physics and Astronomy of Uppsala University (Sweden) and the Institute of Computer and Network Engineering of the TU Braunschweig (Germany). OSIRIS was financially supported by the national funding agencies of Germany (DLR), France (CNES), Italy (ASI), Spain, and Sweden and the ESA Technical Directorate.

Rosetta is an ESA mission with contributions from its member states and NASA. Rosetta's Philae lander is provided by a consortium led by DLR, MPS, CNES and ASI. Rosetta will be the first mission in history to rendezvous with a comet, escort it as it orbits the sun, and deploy a lander to its surface.

For more information on the U.S. instruments aboard Rosetta, visit: <http://rosetta.jpl.nasa.gov>

More information about Rosetta is available at: <http://www.esa.int/rosetta>

Source: NASA/Jet Propulsion Laboratory
Courtesy: Science Daily

Gaia discovers its first supernova

This powerful event, now named Gaia14aaa, took place in a distant galaxy some 500 million light-years away.

By [ESA, Noordwijk, Netherlands](#)

While scanning the sky to measure the positions and movements of stars in our galaxy, Gaia has discovered its first stellar explosion in another galaxy far away.

This powerful event, now named Gaia14aaa, took place in a distant galaxy some 500 million light-years away and was revealed via a sudden rise in the galaxy's brightness between two Gaia observations separated by one month.

Gaia, which began its scientific work July 25, repeatedly scans the entire sky, so that each of the roughly 1 billion stars in the final catalog will be examined an average of 70 times over the next five years.

"This kind of repeated survey comes in handy for studying the changeable nature of the sky," said Simon Hodgkin from the Institute of Astronomy in Cambridge, United Kingdom.

Many astronomical sources are variable: Some exhibit a regular pattern, with a periodically rising and declining brightness, while others may undergo sudden and dramatic changes.

"As Gaia goes back to each patch of the sky over and over, we have a chance to spot thousands of 'guest stars' on the celestial tapestry," said Hodgkin. "These transient sources can be signposts to some of the most powerful phenomena in the universe, like this supernova."

Hodgkin is part of Gaia's Science Alert Team, which includes astronomers from the universities of Cambridge, United Kingdom, and Warsaw, Poland, who are combing through the scans in search of unexpected changes.

It did not take long until they found the first "anomaly" in the form of a sudden spike in the light coming from a distant galaxy that was detected August 30. The same galaxy appeared much dimmer when Gaia first looked at it just a month before.

"We immediately thought it might be a supernova, but needed more clues to back up our claim," said Łukasz Wyrzykowski from the Warsaw University Astronomical Observatory in Poland.

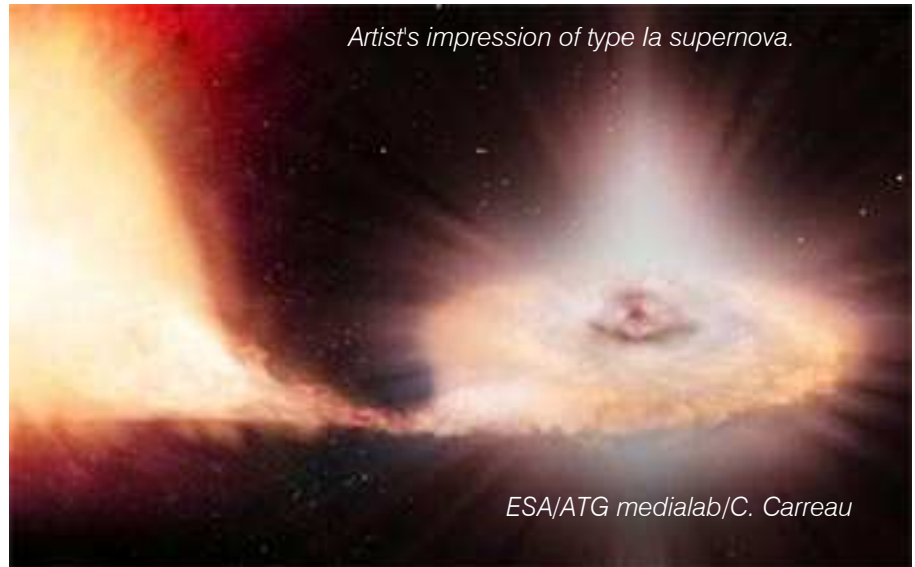
Other powerful cosmic events may resemble a supernova in a distant galaxy, such as outbursts caused by the mass-devouring supermassive black hole at the galaxy center.

However, in Gaia14aaa, the position of the bright spot of light was slightly offset from the galaxy's core, suggesting that it was unlikely to be related to a central black hole.

So, the astronomers looked for more information in the light of this new source. Besides recording the position and brightness of stars and galaxies, Gaia also splits their light to create a spectrum. In fact, Gaia uses two prisms spanning red and blue wavelength regions to produce a low-resolution spectrum that allows astronomers to seek signatures of the various chemical elements present in the source of that light.

"In the spectrum of this source, we could already see the presence of iron and other elements that are known to be found in supernovae," said Nadejda Blagorodnova from the Institute of Astronomy in Cambridge.

In addition, the blue part of the spectrum appears significantly brighter than the red part, as expected in a supernova. And not just any supernova: The astronomers already suspected it might be a type Ia supernova — the explosion of a white



Artist's impression of type Ia supernova.

ESA/ATG medialab/C. Carreau

dwarf locked in a binary system with a companion star.

While other types of supernovae are the explosive demises of massive stars several times more massive than the Sun, type Ia supernovae are the end product of their less massive counterparts.

Low-mass stars, with masses similar to the Sun's, end their lives gently, puffing up their outer layers and leaving behind a compact white dwarf. Their high density means that white dwarfs can exert an intense gravitational pull on a nearby companion star, accreting mass from it until the white dwarf reaches a critical mass that then sparks a violent explosion.

To confirm the nature of this supernova, the astronomers complemented the Gaia data with more observations from the ground, using the Isaac Newton Telescope (INT) and the robotic Liverpool Telescope on La Palma in the Canary Islands, Spain.

A high-resolution spectrum obtained September 3 with the INT not only confirmed that the explosion corresponds to a type Ia supernova, but also provided an estimate of its distance. This proved that the supernova happened in the galaxy where it was observed.

"This is the first supernova in what we expect to be a long series of discoveries with Gaia," said Timo Prusti from the European Space Agency.

Supernovae are rare events. Only a couple of these explosions happen every century in a typical galaxy. But they are not so rare over the whole sky if we take into account the hundreds of billions of galaxies that populate the universe.

Astronomers in the Science Alert Team are currently getting acquainted with the data, testing and optimizing their detection software. In a few months, they expect Gaia to discover about three new supernovae every day.

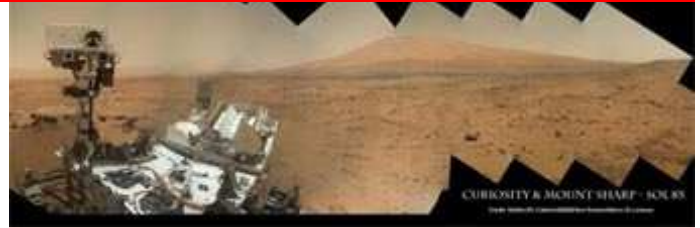
In addition to supernovae, Gaia will discover thousands of transient sources of other kinds — stellar explosions on smaller scales than supernovae, flares from young stars coming to life, outbursts caused by black holes that disrupt and devour a nearby star, and possibly some entirely new phenomena never seen before.

"The sky is ablaze with peculiar sources of light, and we are looking forward to probing plenty of those with Gaia in the coming years," said Prusti.

Courtesy: Astronomy Magazine

An Incredible Journey, Mars Curiosity Rover Reaches the Base of Mount Sharp

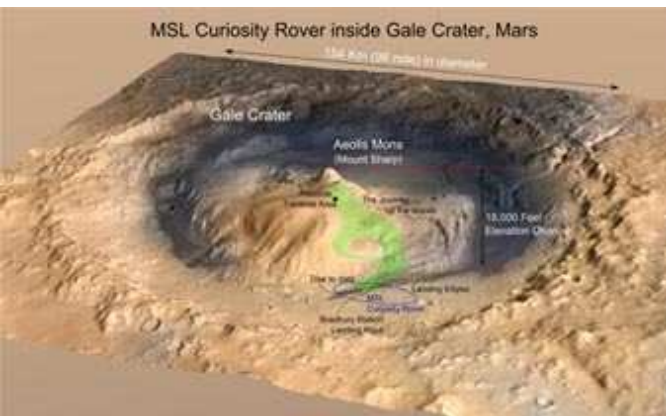
Scientists at the [Jet Propulsion Laboratory](#) have announced that the Mars Science Lab (MSL), Curiosity Rover, has reached the base of the central peak inside Gale Crater, Aeolis Mons also known as Mount Sharp. Mount Sharp is a prime objective of NASA's Curiosity journey. The mountain is like a layer cake, holding a chronology of past events, one after the other, stacked upon each other over billions of years. It took two years and one month to reach this present point and what lies ahead is the beginning of an upward trek towards the peak of Mount Sharp, 5500 meters (18,000 feet) above the floor of Gale Crater. However, it is worth a look back and to consider what Mount Sharp represents to the mission.



The ultimate Selfie – a self-portrait taken on another planet. This is the capability of the Mars Hand Lens Imager (MAHLI) camera, one of 5 instruments on the turret at the end of the 2.1 meter (7 ft), 30 kg (66 lb) Robotic Arm. On numerous occasions, Curiosity has taken self-portraits, many as mosaics. This one is on Sol (Mars day) 85, post landing, showing Curiosity with its destination – Aeolis Mons (Mt. Sharp) in the background. (Credit: NASA/JPL-Caltech/MSSS/Ken Kremer/Marco Di Lorenzo, “Curiosity Celebrates 90 Sols Scooping Mars and Snapping Amazing Self-Portrait with Mount Sharp”)

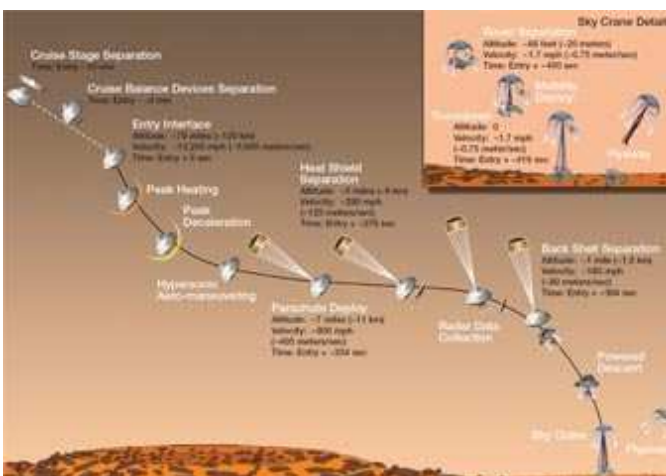


September 27, 2012: A rock outcrop called Link pops out from a Martian surface taken by the 100-millimeter Mast Camera on NASA's Curiosity Mars rover September 2, 2012. Rounded gravel fragments, or clasts, up to a couple inches (few centimeters) in size are in a matrix of white material. The outcrop characteristics are consistent with a sedimentary conglomerate, or a rock that was formed by the deposition of water and is composed of many smaller rounded rocks cemented together. Scientists enhanced the color in this version to show the Martian scene as it would appear under the lighting conditions we have on Earth, which helps in analyzing the terrain. (NASA/JPL-Caltech/MSSS/Handout/Reuters)



MRO image of Gale Crater illustrating the landing location and trek of the Curiosity Rover. In two years, Curiosity traversed 5.5 miles to reach the base of Mount Sharp. The next two years will likely be as challenging but also as rewarding. (Credits: NASA/JPL, illustration, T.Reyes)

For over 17 years, NASA robotic spacecraft have maintained a constant presence above or upon the surface of Mars. The [Mars Pathfinder mission](#) arrived on July 4, 1997, then quickly followed by [Mars Global Surveyor](#) on September 11 and since this time, there has always been at least one active Mars mission.



“Seven Minutes of Terror” – the Entry, Descent and Landing (EDL) of the Mars Science Lab (MSL) – Mars Curiosity Rover. (Credit: NASA/JPL)

On November 26, 2011, the voyage of Mars Curiosity Rover began as a trek across 320 million kilometers (200 million miles) of the inner Solar System and culminated in the coined “Seven Minutes of Terror”. For seven long minutes, the MSL,

the Mars Curiosity Rover, plowed straight into the Martian atmosphere – the entry, deployed a parachute – the descent, to slow down to about 320 km/hour (200 mph) then the Sky Crane with Rover under foot was released – the landing. With only seconds before an imminent hard impact, the Sky Crane hit the breaks, firing its rockets, then released Curiosity Rover on a tether. This was the Entry, Descent and Landing (EDL). All the while, it was the computer inside the Rover in control. When the tether was cut, the Sky Crane was forced to switch to a simpler processor within its system to complete a final scuttling of itself a few hundred meters away.

The Sky Crane gently lowered Curiosity to the landing point, christened Bradbury Station after the celebrated science fiction writer, Ray Bradbury, writer of the Martian Chronicles (c.1950), who passed away at age 91, 61 days before the landing on August 5, 2012. (recommended video – R. Bradbury reading “If Only We had been Taller” at the public event marking the arrival of Mariner 9 at Mars, November 12, 1971)

(Continued on page 16)

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Mars Curiosity at the "John Klein" site in Yellow Knife Bay on January 10, 2013 (Mars Sol 153). The Mastcam mosaic was taken from 5 meters (16 ft). The area is full of fractures and veins with intervening rock with concretions (small spherical concentrations of minerals). The enlargements show particular areas of interest. (A) Ridge-like veins protruding from the surface. (B) Shows discontinuities in the veins that likely extend beneath the surface. (C) Shows a hole developed in the sand that overlies a fracture, implying infiltration of sand down into the fracture system. To this author, the area around (A) seems similar to the remnants of dried mud chips or scales one finds in the dry areas of estuaries on Earth. (Credits: NASA/JPL)



HIRISE images from the orbiting MRO spacecraft are used to show the old and new routes of NASA's Mars Curiosity rover. The new route provides excellent access to many features in the Murray Formation. And it will eventually pass by the Murray Formation's namesake, Murray Buttes, previously considered to be the entry point to Mt. Sharp. (Credit: NASA/JPL-Caltech/Univ. of Arizona)

What has followed in the last 25 months since the landing is simply staggering. Mars Curiosity Rover, with the most advanced array of instruments and tools ever delivered to a celestial body, has already delivered an immense trove of images and scientific data that is improving and changing our understanding of Mars.

Curiosity had been making progress towards an entry point to Mount Sharp called Murray Buttes, however, because of chal-

lenges that the terrain posed – sand dunes and treacherous rocks, they have chosen to enter at Pahrump Hills. Furthermore, the new entry to the lower slopes of Mount Sharp are considered scientifically more interesting. The boundary between the mountain and the crater-floor deposits is not an exact one but NASA scientists explained the reason for the announcement at this point:

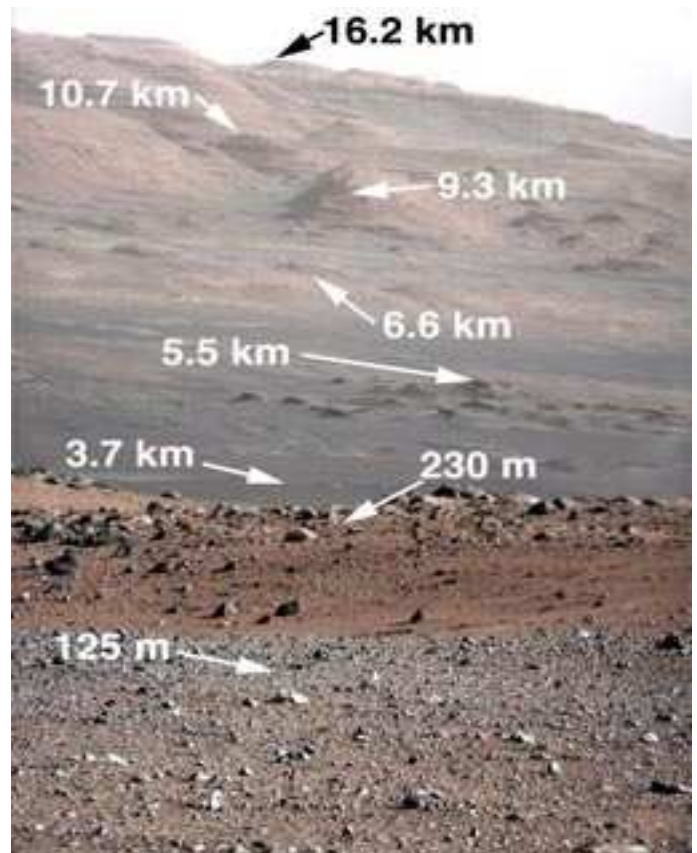


Image taken by the MastCam of Curiosity Rover on August 23, 2012 which shows the buttes representing the base of Mount Sharp, including Murray Buttes. Today, two years later, Mars Curiosity now stands at entry points in the region of the buttes at 6.6 km (direct line distance). In the middle of the image is the boulder-strewn area in which much of Curiosity's wheel damage occurred. At top are the expansive series of sediments that is the great interest of Mars researchers. (Credit: NASA/JPL)

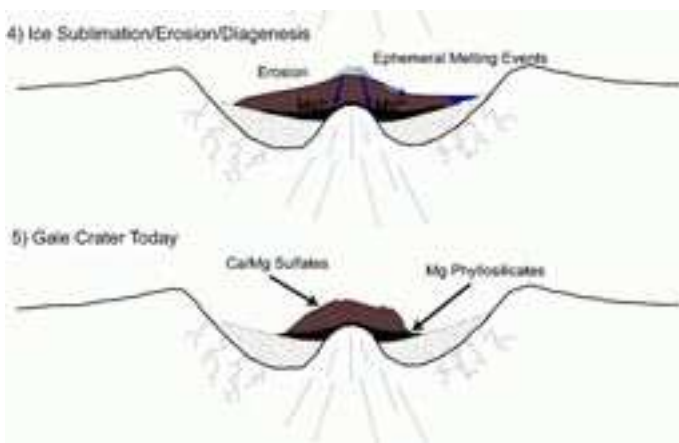
"Both entry points lay along a boundary where the southern base layer of the mountain meets crater-floor deposits washed down from the crater's northern rim." The terrain is now primarily material from the mountain from here on upward.

Mount Sharp is anything but the normal central peak of an impact crater. Gale crater at 154 km (96 miles) in diameter is what is called a complex crater. Beyond a certain size, depending on the gravity of the planet, craters will have a central peak. It is similar to the spike of water which is thrust upwards when you drop an object into a pool of water. Like the spike of water, an impact, thrusts regolith upwards and it collapses and coalesces into a central peak. However, with Mount Sharp there is something more. If the peak was nothing but a central impact peak, NASA with Mars Curiosity would not be trekking inside Gale Crater.

Mars scientists believe that Gale crater after its creation was completely filled with sedimentary material from a series of huge floods passing over the surrounding terrain or by dust and ice deposits such as happened at the Martian polar caps. The deposition over 2 billion years left a series sedimentary layers that filled the crater.

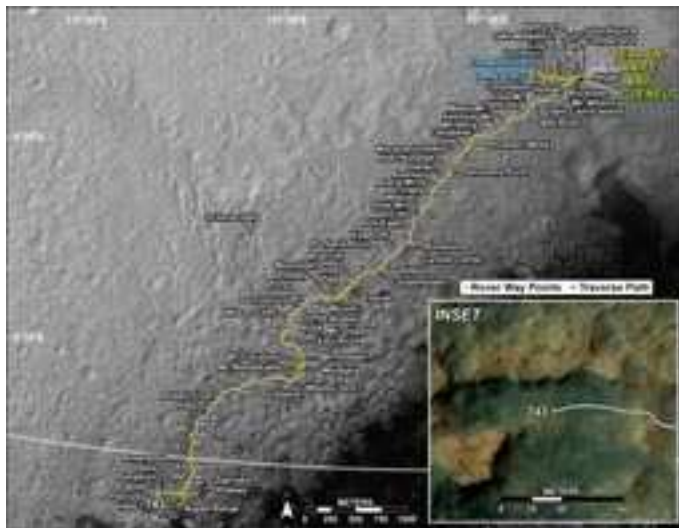
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As data and analysis has accumulated from not just Mars Curiosity Rover but rather from all the active Mars missions, the models and hypotheses describing the structure and morphology on Mars have become more complex. This model and explanation of how Mount Sharp built up over billions of years uses deposition of ice and dust. (Credit: Illustration presented by Paul Niles (NASA Johnson Space Center) and Joseph Michalski (Planetary Science Institute, UK) at the 43rd Lunar and Planetary Science Conference, The Woodlands, Texas)

Following the deposition of the layers, there was a long period of erosion which has finally led to the condition of the crater today. The erosion by some combination of aeolian (wind) forces and water (additional flooding), scooped out the huge crater, re-exposing most of the original depth. However, covering the original central peak are many sedimentary layers of debris. Gale crater's original central peak actually remains completely hidden and covered by sedimentation. This is what has attracted scientists with Curiosity to the base of Mount Sharp.



The trek of NASA's Curiosity Rover from Bradbury Station (landing site, Sol 1) up to Martian Sol 743. The announcement that Curiosity had reached the base of Mt. Sharp is Sol 746. On Martian Sol 675, the Rover took its first step beyond its landing ellipse. (Credit: NASA/JPL)

Within the sedimentary layers covering Mount Sharp, there is a sequential record of the events that laid down the layers. Embedded in each of those layers is a record of the environmental conditions on Mars going back over 2 billion years. At the base are the oldest sedimentary layers and as Curiosity climbs the flanks of the mountain, it will step forward in time. The advanced instrumentation residing on and inside Curiosity will be able to analyze each layer for material content and also determine its age. Each layer and its age will reveal information such as how much water was present, whether the water was alkaline or

acidic, if there is any organic compounds. The discovery of organic compounds on Mount Sharp could be, well, Earth shaking. There are organic compounds and then there are organic compounds that are linked to life and this search for organics is of very high importance to this mission.



In late 2013, wear and tear accelerated on Curiosity's wheels, the result of crossing boulder-strewn terrain. Clearly signs of punctures, tears and dents are seen in the photo taken by Curiosity performing a self-inspection. While it certainly raised alarm, mission planners remain confident that it can be handled and will not limit the duration of the mission. (Credits: NASA/JPL)

Already, over the two year trek, Curiosity has seen numerous signs of the flow of water and sedimentation. At its first major waypoint, Glenelg, Curiosity stepped into an area called Yellow Knife Bay that showed numerous signs of past water. There were veins of magnesium salt deposits embedded in the soil, sedimentation and even conglomerate rock such as that found in river beds.

There is another side to the terrain that Curiosity is traversing. The crater floor, essentially a flood plain has been particularly hard on the mobility system of Curiosity. This is to say that the sharp rocks it continues to encounter under foot are taking a toll on the wheels. Curiosity is now being operated in reverse in order to reduced the impact forces on its wheels.

Furthermore, while scientists are helping to choose the path of the rover, the Curiosity drivers who must assess the field ahead must find paths with fewer sharp rocks in order to slow the damage being done. The Mars Curiosity team is concerned but remain confident that the mobility system will be capable of surviving the ten year life span of the rover's power supply. So, the momentous occasion is hardly a time to pause and reflect, the trek moves upward, northward to see what the layers on Mount Sharp will reveal.

There are competing hypotheses on how Mount Sharp evolved. Here are two worthy web pages with additional reading.

["Crater mound a prize and puzzle for Mars rover"](#), Eric Hand, August 3, 2012

["Big pile in Gale Crater"](#), R. Burnham, March 30, 2012

For further reading -

["NASA's Mars Curiosity Rover Arrives at Martian Mountain"](#), September 11, 2014

[Recommended gateway to the Mars Curiosity web pages – a Curiosity Slide Show](#)

by Tim Reyes on September 12, 2014
Courtesy: Universe Today

NASA identifying candidate asteroids for redirect mission

NASA is on the hunt to add potential candidate target asteroids for the agency's Asteroid Redirect Mission (ARM). The robotic mission will identify, capture and redirect a near-Earth asteroid to a stable orbit around the moon. In the 2020s, astronauts will explore the asteroid and return to Earth with samples. This will test and advance new technologies and spaceflight experience needed to take humans to Mars in the 2030s.

NASA has two options for robotic asteroid capture. One concept would capture a small asteroid in its "native orbit" -- the natural orbit in which it is found. The other would retrieve a boulder from a larger asteroid. NASA will decide between the capture options in December and hold a Mission Concept Review in early 2015, which will further refine the design of the mission.

A lean, agile team of NASA engineers are testing the two concepts, capitalizing on technology and engineering work already underway at NASA. Four industry teams selected through NASA's recent Broad Agency Announcement also are developing concepts to either enhance this work or provide alternative ideas.

NASA's plans to announce the target asteroid for the mission approximately a year before launching the robotic spacecraft, scheduled for no earlier than 2019. To date NASA has identified three valid candidates for the small asteroid concept and three for the boulder concept. The agency expects to identify one or two additional candidates each year that could become valid targets for the mission.

Before an asteroid can make the valid candidate list, NASA's ARM target identification criteria must be met. Scientists must determine the rotation, shape, precise orbit, spectral class, and most importantly, size of the asteroid itself. With the asteroid millions of miles away from Earth, defining these factors requires a series of observations and analysis.

Telescopes on Earth and in space contribute to the observation, tracking and characterization of an asteroid. The process begins by detecting Near Earth Objects (NEOs) and starting to track their orbits. Ground observatories first scan an area in the sky to detect an object moving across the background of stationary stars and report its position in relation to them. The International Astronomical Union Minor Planet Center collects the resulting data and determines if the object has already been identified. If classified as a new object, scientists will be able to have a rough orbit and estimate of the size of the object within a day or two of the initial discovery.

Detecting an asteroid isn't enough to conclude it could be a good candidate for NASA's asteroid mission. Scientists need to further understand an asteroid's shape, size, spin rate, and even surface features when picking a candidate. The best way to precisely measure these characteristics is with interplanetary radar, but only if the object is close enough to Earth to be observed this way. When the asteroid is not within the range of radar, the NASA's Spitzer Space Telescope can contribute to the data collection using infrared imaging if the object can be seen by it.

Infrared light is a better indicator of an object's true size because by measuring its infrared glow the amount of solar heating the entire object re-radiates can be determined. Combining the data collected by Spitzer and ground observatories allows an asteroid's density and mass to be more precisely estimated. Spitzer's infrared imaging has



On the left, a notional concept image of ARM robotic capture option A, which would envelop an entire free-flying asteroid. On the right, a notional concept image of ARM robotic capture option B, which would retrieve a boulder from a larger asteroid. *Credit: NASA*

enabled NASA to determine the size of two ARM candidates thus far.

The three valid candidates so far for the small asteroid concept are 2009 BD, 2011 MD and 2013 EC20. The size of 2009 BD is estimated to be roughly 4 meters (13 feet) in size, while 2011 MD is estimated to be approximately 6 meters (20 feet). These sizes are inferred by data provided by the Spitzer observatory. 2013 EC20 is about 2 meters (7 feet) in size, as determined by radar imaging.

Most known large asteroids are too big to be fully captured and have orbits too distant for the ARM spacecraft to redirect them into orbit around the moon. Some are so distant when discovered that their size and makeup are difficult for even our most powerful telescopes to discern. Still, others could be potential candidates but go from newly discovered to out of our telescope range so quickly that there is not enough time to observe them adequately.

There are currently three validated asteroid candidates for the boulder concept, known as Itokawa, Bennu and 2008 EV5. Itokawa was well characterized by close and direct observation on the Japanese Hayabusa mission and is known to contain boulders an ideal size of roughly 3 meters (10 feet). Both 2008 EV5 and Bennu have been imaged via radar, collecting data from which it can be inferred they have boulders of the appropriate size. In addition, NASA's OSIRIS-REx mission to launch in 2016 will study Bennu, and conduct detailed mapping of the surface of the asteroid in addition to taking samples and returning them to Earth for further study.

Any asteroid ultimately chosen for the mission will contain remnants of material from the solar system's formation. In the 2020s, astronauts will visit the asteroid for a number of activities, including returning to Earth with substantial selected samples. The results could open new scientific learning about the formation of our solar system and the beginning of life on Earth, inform us about what resources asteroids may contain for use in future exploration, and foster partnerships with industry for future endeavors in space.

ARM will help NASA test and advance the technologies necessary for future human missions to and from Mars, including Solar Electric Propulsion, human spaceflight aboard the Orion spacecraft and the Space Launch System (SLS) rocket, and complex mission operations in deep space orbits. To learn more about ARM's impact on the manned mission to Mars, visit [How Will NASA's Asteroid Redirect Mission Help Humans Reach Mars?](#)

Courtesy: Science Daily

Mystery of 'Hot Jupiter' Planets' Crazy Orbits May Be Solved

Giant alien planets known as "hot Jupiters" orbit their stars much closer than Mercury does the sun. But the mystery of the origins of hot Jupiters deepened when astronomers recently discovered the scorching orbits of these worlds are often bizarrely skewed, tilted when compared with the equators of their stars.

Now, scientists might have solved the mystery behind why hot Jupiters have such weird orbits— as these giant worlds drew close to their stars, they may have forced the stars to wobble chaotically.

Hot Jupiters are gas giant planets, much like Saturn or Jupiter, that orbit extraordinarily close to their stars, at about one-tenth of the distance from Mercury to the sun. About 1 percent of sunlike stars host these roaster planets.

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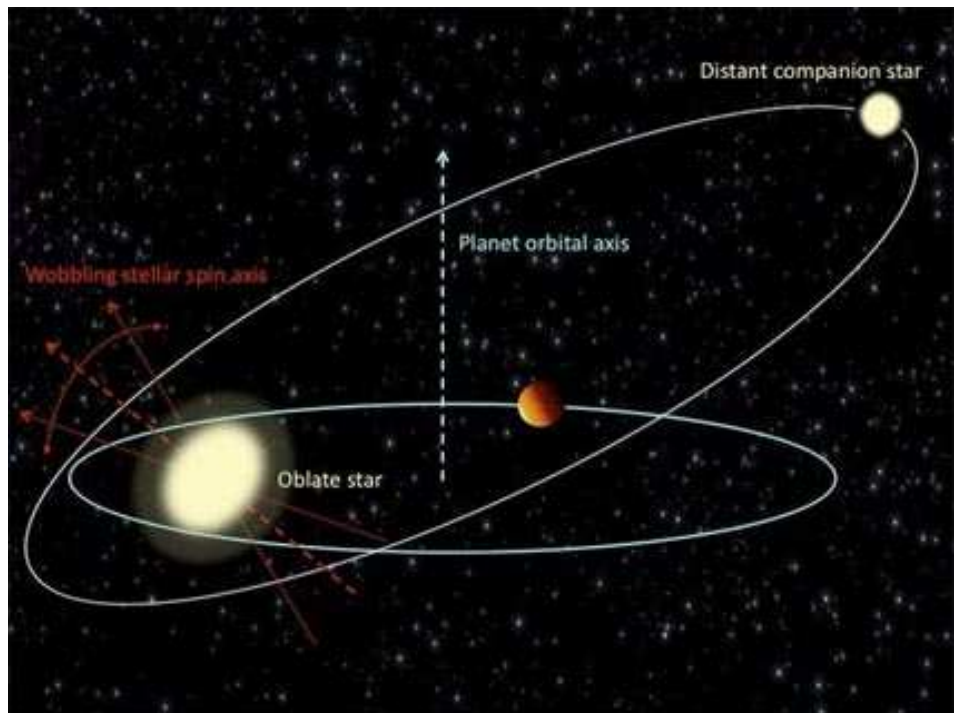
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Hot Jupiters are gas giant planets, much like Saturn or Jupiter, that orbit extraordinarily close to their stars, at about one-tenth of the distance from Mercury to the sun. About 1 percent of sunlike stars host these roaster planets.

When planets migrate toward their stars, previous research suggested these exoplanets should usually end up circling the equators of their stars, just as all of the major planets in the solar system do around the sun. However, in the past four or five years, astronomers have discovered that more than half of all hot Jupiters seen to date have orbits that are mysteriously inclined — that is, they are tilted in relation to their stars' equators.

These scorching, tilted orbits might result from the way hot Jupiters cause their stars to dance chaotically as the planets migrate inward, scientists believe.

"We call hot Jupiters giant planets, but they're very small compared to their stars, about a thousand times less mass, so it's quite surprising such planets can cause such dramatic changes to their star's spin," said study co-author Dong Lai, an astrophysicist at Cornell University in Ithaca, New York.



*Giant alien planets known as "hot Jupiters" can induce wobbles in their parent stars that may lead to the wild, close orbits seen by astronomers. This diagram shows the relationship between wobbling stars and the orbital tilt of hot Jupiter planets.
Credit: Cornell University/N.Storch, K.Anderson, D.Lai*

When a star and its planets are born from a spinning disk of gas and dust, they all generally rotate the same way, and the orbits of the planets all line up with the star's equator. If a star is in a binary system, the gravitational influence of a companion star can make a planet migrate inward.

In computer simulations involving planets with a range of masses and stars with a variety of rates of spin, the scientists found that as a planet comes near its host star, it can make the star's axis of spin wobble in a complex and even unpredictable way. "We didn't anticipate this chaotic behavior," Lai told Space.com.

The way the poles of spin of these stars can sway chaotically "is similar to other chaotic phenomena found in nature, such as weather and climate, where the outcome may depend sensitively on the initial conditions, the so-called 'butterfly effect,'" Lai said. "You also see chaotic behavior in the direction of the axis of rotation of Mars. The way Mars' axis of spin has wandered over time has had a huge impact on the climate of Mars."

Lai and graduate students Natalia Storch and Cassandra Anderson detailed their findings in the Sept. 12 issue of the journal *Science*.

By Charles Q. Choi, Space.com Contributor

You can follow Charles Choi on Twitter @cqchoi.

Courtesy: Space.com

NASA Prepares To Pepper ISS with Earth Science Instruments

Despite an orbit that is out of the ordinary for NASA's Earth Science Division, the international space station's convenience as a host platform has convinced the agency to install five more Earth-facing instruments at the outpost during the next four years — and perhaps add as many as five times that number of instruments before the station's planned end of life sometime next decade, NASA officials said in a Sept. 9 media briefing.

The five instruments slated to be installed by 2018 will make a total of seven aboard station, which already hosts two, Julie Robinson, chief scientist for the ISS program, said here during the briefing, which also featured NASA officials from other centers who participated via video conference.

The plan is to keep adding Earth-observing instrument to ISS — which is officially set to fly through 2020, although the White House is seeking an extension through 2024 — “until we have all 25 external [ISS] sites completely full,” Robinson said.

The space station's orbit is inclined at 51.6 degrees, so an Earth-facing ISS instrument will never get a glimpse of latitudes further north or south than that. This rules station out as a platform for observing the Arctic or Antarctic poles. While ISS flies over the same spot every three days, it sees the same spot in the same lighting conditions only once every 62 days. An ISS-mounted instrument therefore “takes a lot longer to get a massive database” of comparable images than a similar instrument mounted over a sun-synchronous satellite, which sees every point in its orbit under the same lighting conditions each orbit, Steve Volz, the Earth Science Division's associate director for flight programs, said during the briefing.

The space station also “wiggles and jiggles,” so unless an instrument team is “willing to spend millions on stability systems and star trackers,” it would not be possible to clearly observe objects smaller than about a meter in size from station's orbit, Matthew McGill, principal investigator for the Cloud-Aerosol Transport System instrument headed to station in December aboard a Space Exploration Technologies Corp. Dragon capsule, said in an interview with *SpaceNews*.

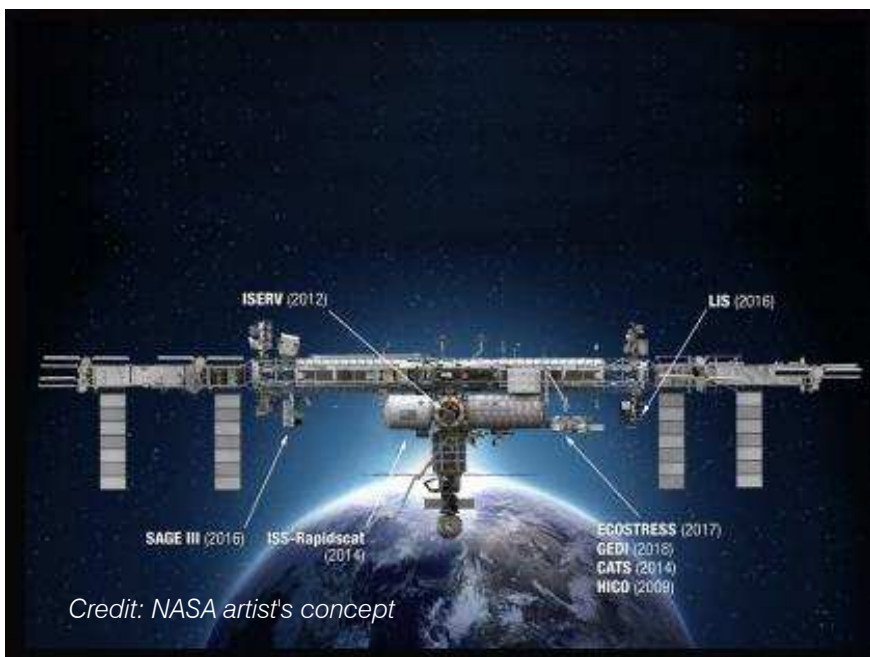
On the upside, the station's peculiar orbit offers Earth scientists a way to observe any point between Earth's 51.6-degree parallels under different conditions — something a geographically limited geostationary satellite or a temporally constrained sun-synchronous satellite cannot, Volz said.

“It gives you a different perspective,” Volz said. For example, soil moisture conditions and wind speeds vary day by day and hour by hour, as does “the way the vegetation reflects light. Seeing [that] from different angles, you get different perspectives on how the vegetation health is as well,” Volz said.

“We're really observing a maturity of the space station as an Earth science platform,” Robinson said.

Despite the maturation, ISS is still in an adolescent phase as an Earth observation platform. The station's first Earth-science instrument, the Hyperspectral Imager for the Coastal Ocean, arrived in 2009. The instrument was developed by the Office of Naval Research, but was later taken over by NASA. The space agency is interested in hyperspectral imaging, which offers about a hundred bands of information. By comparison, the two imaging instruments on Landsat 8, the latest in the 40-year-plus Landsat series of Earth imaging satellites, combine for 11 bands of information.

After the Hyperspectral Imager for the Coastal Ocean came the internally mounted ISS Servir Environmental Research and



Credit: NASA artist's concept

Visualization System: a high-quality digital camera that launched in 2012 that captures three images of the Earth every second, each of which covers an area of about 19 kilometers by 11 kilometers.

The next five instruments to launch will be:

- ISS-RapidScat, which will launch aboard a SpaceX Dragon spacecraft no earlier than Sept. 19 to monitor ocean winds for climate research, weather predictions and hurricane monitoring.
- Cloud-Aerosol Transport System, a light-detection and ranging system that will measure atmospheric pollutants. SpaceX will also launch this sensor, which is slated to ride to ISS aboard a Dragon due to lift off in early December.
- The Stratospheric Aerosol and Gas Experiment 3 on ISS, which will observe the protective layer of ozone that shields Earth from solar radiation. SpaceX is slated to deliver the sensor in March 2015.
- The Lighting Imaging Sensor, which will measure the frequency and occurrence of lightning strikes. The sensor will launch in 2016, the same year a similar sensor aboard NASA's Tropical Rainfall Measuring Mission will be destroyed along with the host satellite in a planned end-of-mission re-entry into Earth's atmosphere.
- The Ecosystem Spaceborne Thermal Radiometer Experiment on Space Station, a multispectral infrared imager launching in 2017.
- The Global Ecosystem Dynamics Investigation Lidar, which will use a laser-based system to observe, among other things, forest canopy structures over the tropics, and the tundra in high northern latitudes.

Even if all of these instruments perform well, it will not mean an automatic ticket for a successor instrument to fly aboard its own satellite, Volz said.

However, Volz added, “successful demonstration by any or all of these instruments could certainly ... influence our decisions on how to go about getting the longer-term measurements.”

By [Dan Leone](#)

Courtesy: [Spacenews.com](#)

Planet forming around star about 335 light years from Earth

Dr. John Carr, a scientist at the U.S. Naval Research Laboratory (NRL), is part of an international team that has discovered what they believe is evidence of a planet forming around a star about 335 light years from Earth. This research is published in the August 20th issue of *The Astrophysical Journal*.

Carr and the other research team members set out to study the protoplanetary disk around a star known as HD 100546, and as sometimes happens in scientific inquiry, it was by "chance" that they stumbled upon the formation of the planet orbiting this star. A protoplanetary disk, or circumstellar disk, is a very large disk of material orbiting a newly formed star out of which a planetary system may form. The team was studying the warm gas in this disk using a technique called spectroastrometry, which allows astronomers to detect small changes in the position of moving gas.

The researchers discovered an "extra" source of gaseous emission from carbon monoxide molecules that could not be explained by the protoplanetary disk alone. By tracking the changes in velocity and position of this extra emission over the years of the observations, they were able to show that it is orbiting around the young star. The distance from the star is somewhat larger than the distance of Saturn from the Sun. The evidence suggests that they are observing hot gas that surrounds an orbiting young planet. Carr points out that rather than seeing the planet directly, they are detecting the gas as it swirls around and onto the forming planet.

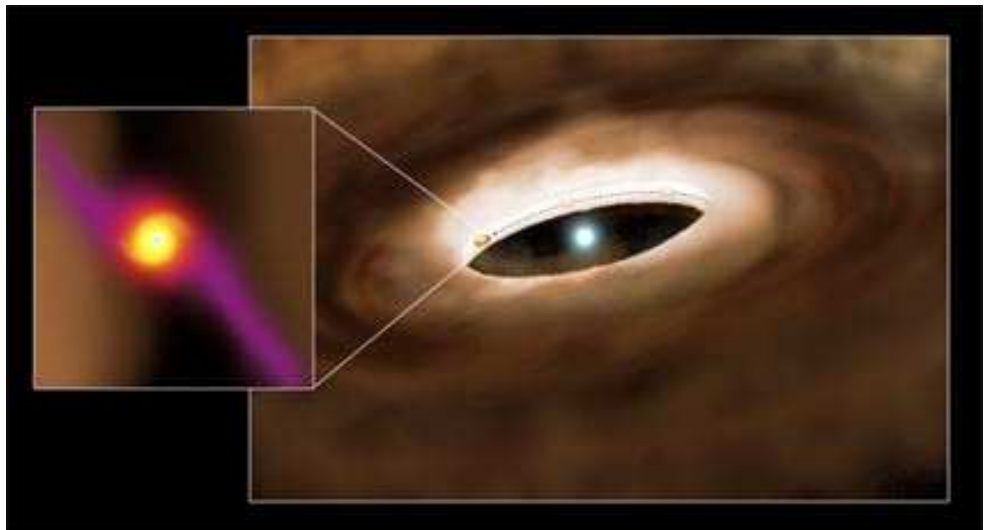
Through modeling carried out by Dr. Sean Brittain, a Clemson University astrophysicist and the lead author on the paper, and with additional data gathered by the team to confirm their initial hypothesis, they were able to investigate the extra emission as it orbited the star. The authors concluded that a likely explanation for the observations is a small circumplanetary disk of hot gas orbiting a forming planet. The candidate planet would be a gas giant at least three times the mass of Jupiter. The theory is that material from the large protoplanetary disk feeds into the circumplanetary disk, which then feeds onto the growing planet. Hence, a circumplanetary disk plays a mediating role in the growth of the planet. The remnants of a circumplanetary disk could also give birth to moons, such as those seen around Jupiter in our solar system. As Carr explains, a novel aspect of this new evidence for planet formation is the possible detection of a circumplanetary disk.

The team's study is based on four sets of observations gathered in 2003, 2006, 2010, and 2013. They used the Gemini Observatory and the Very Large Telescope at the European Southern Observatory, both located in Chile. The Gemini Observatory consists of twin 8.1-meter diameter optical/infrared telescopes located on mountains in Hawaii and Chile. The VLT is not just one telescope, but an array of four, each with a main mirror of 8.2 meters in diameter. The data were collected using high-resolution infrared spectrographs that allowed precise

measurements of the motions of molecular gas surrounding the star.

"These results provide a rare opportunity," Carr says, "to study planet formation in action. Our analysis strongly suggests we are observing a disk of hot gas that surrounds a forming giant planet in orbit around the star. While such circumplanetary disks have been theorized to surround giant planets at birth and to control the flow of gas onto the growing planet, these findings are the first observational evidence for their existence. If our interpretation is correct, we are essentially seeing a planet caught in the act of formation."

Looking ahead, the team would like to continue to monitor the motion of the planet and obtain additional data to better define the properties of the circumplanetary disk. They predict that the planet and its disk will disappear from view in about two years time when they become hidden by the inner edge of the circumstellar disk. So, if the team's model is correct, the signature of the orbiting planet will not be seen for another 15 years until its orbit brings it back into view.



An artist's conception of the young massive star HD100546 and its surrounding disk. A planet forming in the disk has cleared the disk within 1.3AU of the star, a distance comparable to that of Saturn from the sun. As gas and dust flows from the circumstellar disk to the planet, this material surrounds the planet as a circumplanetary disk (inset). These rotating disks are believed to be the birthplaces of planetary moons, such as the Galilean moons that orbit Jupiter. While they are theoretically predicted to surround giant planets at birth, there has been little observational evidence to date for circumplanetary disks outside the solar system. Brittain et al. (2014) report evidence for an orbiting source of carbon monoxide emission whose size is consistent with theoretical predictions for a circumplanetary disk. Observations over 10 years trace the orbit of the forming planet from behind the near side of the circumstellar disk in 2003 to the far side of the disk in 2013. These observations provide a new way to study how planets form.

Credit: P. Marenfeld & NOAO/AURA/NSF

The above story is based on materials provided by

Naval Research Laboratory.

Credit: ScienceDaily