Sagittarius

The Newsletter of the Astronomy Section of La Société Guernesiaise

April – June 2010

Forthcoming Events

Public Open Evening

Tuesday 20th April
9.00 pm at the Observatory

Public Lectures:

Guernsey Heroes of the Royal Society: Amanda Bennett / David Le Conte

Thursday 13th May 2010
8.00 pm at Les Côtils Centre

Dr Arfon Smith: From Galaxy Zoo to the Zooniverse - the Rise of the Citizen Scientist

Monday 17th May 2010
6.00 pm at St James
(tickets cost: £10.00, Students free)

In addition, the Section meets at the Observatory every Tuesday evening, and Friday if clear for observing.

Inside

Inserts

Star chart

Sunset, sunrise, moonset and moonrise times

Section News

The running of the Observatory is now getting back to normal. Recent months have seen a large number of visitor groups and the annual WEA "Star Gazing" course which again has proved popular and fully subscribed.

Following the refurbishment of the Main building there was a formal reopening of the building by Lieutenant Governor, Sir Fabion Malbon. Unfortunately the skies did not clear that evening and we hope to be able to invite Sir Fabion again before his return to the UK early in 2011. The reopening did receive attention in the media.

The main building now has new furniture - surplus office furniture from a local company and new chairs purchased from funds. However of particular note is the purchase of our own projector which proved very useful for the WEA course. We will be able to view a webcam on the Meade projected on the wall in the comfort of the main building.

Now the refurbishment is complete there is further work needed at the Observatory and we need to turn our attention to the Meade Telescope building. A major piece of work will be to reconstruct the framework for the runoff for the sliding roof. This is constructed from greenhouse timbers many of which are now rotted. The roof itself is leaking, we believe at the apex and needs to be fixed before any damage is done to the telescopes. There is no need for external decoration of the main building but the shed and Meade building are looking shabby in comparison and need decoration. We plan to hold a working weekend in the summer to tackle these tasks – further announcements later in the year.

Please note that there are lecture and exhibition announcements later in this edition of Sagittarius. Geoff Falla's article about the Royal Society coincides with the current exhibition at the Priaulx Library.

The schedule of Public Open Evenings this year are as follows:

20	April	9.00 pm
27	July	9.30 pm
03	August	9.30 pm
10	August	9.30 pm
17	August	9.00 pm
24	August	9.00 pm
31	August	9.00 pm
12	October	8.00 pm

We are now suggesting donations of £2 per adult and £1 per child for these evenings.

Please note that Astronomy Section subscriptions are now due for 2010 (unchanged from 2009).

Families/Couples: £10
Individuals: £6
OAP / Juniors: £3

Colin Spicer

The Martian Polar Caps

This month I have been taking a closer look at the information obtained, particularly by global surveyor and Odyssey, on the polar caps of Mars.

In 1781, the German born English Astronomer, William Herschel, was the first to speculate publicly that the polar caps on Mars were made of ice. *'This,'* he said, *'would account for their changes in size as they melted and froze in response to the Martian summer and winter.'* We are now, over two hundred years later, in a position to discover if William Herschel's words were correct.

Until the early 1960s, very little was known about the surface of Mars. It was known that traces of oxygen existed and that carbon dioxide made up most of the little atmosphere that Mars had retained. It was speculated that a primitive form of vegetation might exist, but no animal life. In November 1964, NASA launched Marina 4 which passed within 6,000 miles of the planet. It showed a world very similar to the Moon, with a southern polar cap at a temperature of -123 ^{O}C, just the right temperature for frozen carbon dioxide to exist.

This was very disappointing and it seemed that William Herschel may have been mistaken.

Since 1964, both NASA and ESA have launched space vehicles to Mars. These include Mariner 9, Global Surveyor, Phoenix, Odyssey, Viking, Pathfinder, Mars Express along with rovers Spirit and Opportunity. Data from these probes has given us a much clearer understanding of the Martian surface. We now know that the polar caps are far more interesting than Mariner 4 seemed to suggest. There are similarities between the polar caps of Mars and the Earth. For example, both planets have the largest ice cap in the south. This is due to both Earth and Mars having very similar axial inclinations and both being closer to the sun in their southern summer months. Therefore both southern hemispheres spend more time further away from the sun, than their northern hemispheres. This is particularly so for Mars, due to its eccentric orbit.

The polar caps on Mars and the Earth are thought to have been formed in similar ways. During the early years, both planets were being bombarded and became covered in very hot, molten rocks and volcanic lava. Tremendous heat was being produced by the denser rocks heading for the core. This enabled hydrogen and oxygen atoms to combine since it is thought that far more hydrogen existed around all planets forming at that time. Also the planets were being continually hit by comets, which contained mainly water. Initially water was mostly contained inside the rocks, but as the planets cooled, the water became no longer trapped. Volcanic rock contained huge quantities of trapped water.

In these early years of formation, both planets had carbon dioxide atmospheres. The Earth's atmosphere consists mainly of nitrogen and oxygen whilst the Martian atmosphere still consists of carbon dioxide but much less. The atmospheric pressure is less than one hundredth that of the Earth. It would appear from the dried up river beds on Mars, that at one time both Earth and Mars had atmospheres that could sustain oceans of surface water. Assisted by similar axial inclinations and the help of dense atmospheres, the Sun was able to warm the majority of the planet surfaces, so keeping the water above freezing point. As the poles only have indirect heating in the summer and virtually none in the winter, the water in these areas remained frozen.

The polar caps on Earth alter their size, according to seasonal variations in temperature. The polar caps on Mars also change size, due to temperature change, but the reasoning is more complicated. The latest evidence from NASA's Global Surveyor and Odyssey, is that both Martian poles still actually consist of water ice, each with a much larger covering of carbon dioxide ice. The volume of the underlying water ice does not change, because the temperature at either pole is never warmer than -75^{O}C. However this is too warm for the carbon dioxide, which converts directly from solid to gas (process called sublimation) at -78^{O}C. Some of the carbon dioxide covering the water ice turns to gas in the summer and freezes back in the winter. It is this process which gives the seasonal change in size of the polar caps although the water ice content remains constant. It does appear however that the northern polar cap has more water ice than the southern - a diameter of around 600 miles compared to 200 miles. The southern cap has a much larger covering of carbon dioxide, which unlike the northern cap does not totally disappear in summer. It has also been discovered that the northern cap water ice sits inside a huge basin, possibly an enormous impact crater. Much of the water ice in the southern cap sits on a rise and this higher altitude in the south contributes further to the cooler temperature.

To provide the huge carbon dioxide covering of the southern cap, vast quantities of carbon dioxide are frozen out of the atmosphere during the southern winter. This results in an amazing 30% difference in atmospheric pressure all over Mars. In contrast, the northern cap accounts for around 10% difference. It has been discovered that the largest dust storms occur when the planet is closer to the sun. This would tie in very well with the atmospheric pressure being higher and therefore able to carry more dust when it is summer in the southern hemisphere.

The Earth has a very complex weather system, which starts simply with warm air rising at the tropics and heading towards the poles. In turn, the cooler air returns from the poles to the warmer tropics. In practice, the oceans and continental land masses make the weather patterns extremely more

complicated. On Mars there are no complicating land masses or oceans. The sun heats the very thin atmosphere near the equator, which then rises and moves towards both poles. As it rises, it takes the very fine red surface dust with it. As it cools at the poles, it falls to a lower altitude and returns to the equator. This is why much of the polar caps have red dust distributed over the surface.

There is still more to learn about the polar caps of Mars, but at least we know that William Herschel was very close in his speculation. Water ice does exist at the Martian polar caps.

Frank Dowding

Royal Society Anniversary, and Reports from its Journal.

The Royal Society of London was founded in 1660 as Britain's National Academy of Science, and is currently celebrating its 350th anniversary in 2010. The history of the Royal Society was the subject of a recent Guernsey lecture by the Society's chief librarian and archivist, Keith Moore.

Included in the Royal Society's Roll of Honour are Past Presidents Sir Isaac Newton and Sir Christopher Wren. Distinguished Fellows of the Royal Society have included Albert Einstein and Charles Darwin, and more recently Professor Stephen Hawking and Sir David Attenborough. There have also been ten Guernsey Fellows of the Society, including the astronomer and photographer Warren De La Rue, and present Fellow Professor Nicholas Day.

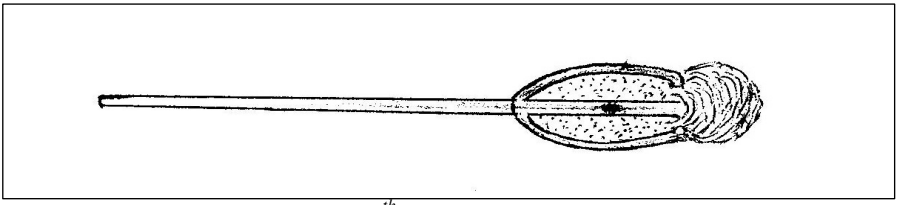
The Philosophical Transactions of the Royal Society is the oldest established of all scientific journals, having been published since the earliest years of the Society, and has contained reports on a wide variety of scientific subjects.

Two particular reports of astronomical interest, highly unusual observations of meteor-like objects, are recorded in issues of the Society's journal published during the 18th century. One of the reports is of an observation from St James Park in London, the other from the terrace of Windsor Castle.

In the first of these remarkable reports, it is recorded that a secretary of the Royal Society, the physician Cromwell Mortimer, was returning home through St James Park to Westminster from the Royal Society at 8.40pm on 16th December 1743, when he saw a light approaching from a south-westerly direction from behind trees and houses. At first the object was taken to be a large sky-rocket, but when it had risen to a height of about 20 degrees the object was seen to have a motion nearly parallel to the horizon - but at the same time having a wave-like undulating movement as it travelled towards the northeast. The object's movement was quite slow, being in view for more than half a minute, allowing the witness time to

study the shape in some detail, and to make an illustration of its appearance.

The front of the object seemed to be a light flame, turning back on itself from the air resistance. Behind this a bright fire like burning charcoal was seen, enclosed as it were in an open case with a quite opaque frame, like bands of iron. Behind this was a train or tail of light flame, becoming gradually fainter towards the tail end so as to be transparent for more than half its length. The head of the object seemed to be half a degree in diameter, the tail three degrees in length and about one eighth of a degree in thickness. (Philosophical Transactions, Vol 43, published 1746, No 477)



Observation from St James Park 16th December 1743.

The second report is an observation from Windsor Castle, at 9.45pm on 18th August 1783. Several leading scientists and artists of the day were part of a group standing on the north-east corner of the Castle terrace when they saw a light emerge from a cloud. The light soon became spherical as it progressed across the sky, before coming to a halt. The object's apparent diameter was .half that of the Moon, but was much more vivid. The strange sphere seemed at first to be pale blue in colour. Its luminosity increased, and it soon set off again towards the east.

The object changed direction and moved parallel to the horizon before disappearing in the southeast, having been in view for half a minute. The light given out by the object was described as prodigious. Before it vanished the object changed its shape and became oblong. At the same time that a sort of trail appeared, it seemed to separate into two smaller bodies, and about two minutes later the sound of an explosion was heard.

One of those present was Thomas Sandby, a famous watercolourist who was also a member of the Royal Academy. He duly painted the event, also producing aquatints of the scene in association with his brother Paul, who was a topographical draughtsman working for the Ordnance Survey, and was also present. (Philosophical Transactions, 1784).

Other reports of astronomical interest in the Royal Society's journal include several observations relating to the Moon - reports from the Cape Town Observatory of a whitish spot seen on the dark part of the Moon's limb with three smaller lights, also a star-like light seen on the Moon's surface on two successive nights, the 28th and

29th November, 1821 (Philosophical Transactions 84-429 and 112-237)

These Cape Town reports may have been examples of what are now known as Transient Lunar Phenomena, some of these perhaps associated with meteorite impacts or periodic moonquake activity.

Geoff Falla

Indian time

The world is entirely covered with time zones. Each county has its time zone (or zones) based on a convenient standard meridian (or meridians, for those countries with a large longitudinal range). Invariably these are an integral number of hours from Greenwich, the corresponding meridian longitudes being exactly divisible by 15 degrees.

I say 'invariably', but actually there are exceptions. One such is the country of India, which I recently visited, and which has a time zone 5 hours and 30 minutes ahead of Greenwich time. This corresponds to a meridian of 82.5 degrees east, which passes close to the city of Allahabad in Uttar Pradesh. It was selected in 1905 by the British as a fairly central meridian for the country, which extends from 70 to almost 90 degrees East, a range of two hours.

For many years, however, Bombay and Calcutta kept their own time zones of 4 hrs 51 minutes and 5 hrs 30 minutes 21 seconds ahead of GMT, respectively, but now the whole of India is covered by just the single time zone.

There are other exceptions to the 15 degree standard. Nepal, which I also visited, is 5 hrs 45 minutes ahead of GMT, corresponding to 86.25 degrees East. This meridian is well east of the capital, Kathmandu, and is far from the centre of the country, which extends East - West from 80 to 88 degrees. I have been unable to determine why it was chosen, and if anyone knows I would be glad to hear of it. Perhaps it has to do with the population distribution?

Several countries, like India, have time zones involving half-hours. These include: Iran (3.5), Afghanistan (4.5), Sri Lanka (5.5) and Burma (8.5), as well as some smaller nations and territories. However, only two have quarter-hour zones: Nepal and the Chatham Islands off New Zealand (12.75 hours ahead of GMT).

Finally, what's the time in India right now? It's easy to find out if you have a watch set to GMT - just turn it upside down!

David Le Conte

Round Britain Quiz

My favourite Radio 4 programme is Round Britain Quiz, a wonderful collection of cryptic questions, including some submitted by listeners. On 14 September last, one of the questions, submitted by listener Ken Lunn, was: "Can you relate: a nocturnal lemur, an island occupied by Circe, and a Jovian attendant – and which agriculturalist might be interested in all of them?" I cannot now recall the details of the answer, particularly the last part, but I believe the lemur was the Aye-aye, the island was the Aeaea, and I am certain that the Jovian attendant was Jupiter's moon Io. What particularly caught my attention was hearing the question master, Tom Sutcliffe, say that Io was the largest moon of Jupiter.

I emailed the programme, pointing out that Io is in fact the third largest Jovian moon, the largest being Ganymede (which is also the largest moon in the solar system). Io is, of course, the closest of the four Galilean satellites to the parent planet, but not the largest.

Somewhat to my surprise I received a prompt response from the Producer, Paul Bajoria. He said: "David, many thanks for your communication about Io, the THIRD-largest moon of Jupiter, which for some reason we did refer to as the largest. I can only apologise for the mistake. Although this question was supplied by a listener, we usually make a point of checking all the facts so I'm not sure how this one slipped through. I hope it didn't spoil your enjoyment of the programme too badly."

Astronomers are quite used to glaring errors being made by the media, especially in newspaper reports, fictional programmes and films. It is reassuring, however, that in this case the BBC acknowledged its mistake, and took the trouble to respond when it was pointed out.

David Le Conte

Geoff Falla's regular roundup of articles from popular Astronomy and Space Journals

A New Infrared Sky. A new NASA space mission is to study the mid-infrared sky. The WISE mission (Wide-field Infrared Survey Explorer) will be the most sensitive highest-resolution survey ever made of the entire sky, and able to detect objects at a temperature almost down to absolute zero. (Sky and Telescope, December 2009)

The Moon - The Best Telescope Target. The Moon has a huge number of features which can be observed in detail using modest-sized telescopes. At Full Moon all of the lunar maria areas can be seen, and at other phases the shadows of lunar mountains and craters reveal their shapes to good

effect. (Sky and Telescope, December 2009)

Making the Most of Mars. This year's opposition of Mars in late January 2010 is not as favourable as in previous years, with maximum diameter at only 14.1 .arc seconds, but in good conditions some of the planet detail, the north polar cap and dark surface markings may be visible. (Sky and Telescope, December 2009)

Winter Nebulae. The Orion Nebula, M42, is always a rewarding sight and the closest region to our solar system showing intense star formation. Also in Orion is the dark Horsehead Nebula, with a small but well-formed shape, and the Flame Nebula behind it. In the constellation of Monoceros there is the Christmas Tree Cluster NGC 2264, discovered by William Herschel in 1784, in Andromeda the Blue Snowball Nebula, NGC 7662, and in Gemini the amazingly shaped Eskimo Nebula, NGC 2392. (Astronomy Now, December 2009)

Hubble's Grand New Vistas. Early results from the new camera and spectrograph installed in the Hubble Space Telescope have shown a high quality of data and images. The telescope's target images included the Stephan's Quintet group of galaxies, and the central region of the massive Omega Centauri globular cluster. The telescope should also be able to study the atmospheres of some planets orbiting other stars. (Astronomy, December 2009)

What can Neutrinos tell us about the Universe? Fusion reactions which power stars, and supernovae are sources of neutrino particles. The neutrinos carry information about all the nuclear reactions, but the particles interact rarely and are very difficult to detect. A south pole experiment, to catch particle interactions in the ice is now in progress.
(Astronomy, December 2009)

Finding the First Galaxies. A new Wide Field Camera recently installed in the Hubble Space Telescope has enabled it to obtain images of small galaxies which are now found to make up the most distant early universe. The new James Webb Space Telescope, due for launch in 2014 will be able to reach even closer to the birth of galaxies. (Sky and Telescope, January 2010)

Spacecraft Imaging for Amateurs. Amateur processors have been able to produce some of the best high quality composite images of planets, including Mars, Venus and Saturn, as well as planetary moons, from original images obtained during recent NASA missions. (Sky and Telescope, January 2010)

The Big Bang Theory. A set of articles focusing on the birth of the Big Bang Theory; on how the universe started and has evolved including the steps in discovering the true scale of the universe; the expansion of the universe as described by Einstein's theory of General Relativity, and the more recent discovery of the cosmic microwave background, giving vital

clues about the true nature of the big bang. (Astronomy Now, January 2010)

The Mars Meteorite Strikes Back. The composition of a meteorite found in Antarctica in 1984 showed that it came from Mars, and further examination of the meteorite found microscopic objects which looked like fossils. Debate about this has continued ever since, with alternative ways in which these objects could have formed, or that the meteorite was contaminated with organisms after it landed. Recent research now seems to have shown that the objects found in the meteorite were formed on Mars in a low temperature environment, and in water. (Astronomy Now, January 2010)

Galaxy Superclusters and what they reveal. The universe contains not only individual galaxies and clusters of galaxies, but also superclusters containing thousands of galaxies. Cosmologists are now trying to discover how the superclusters form and evolve, how they are linked and why the galaxy clusters may form fractal patterns. (Astronomy, January 2010)

How do Planetary Nebulae form? Recent research has shown that there are three main shapes of planetary nebula, and that the shapes seem to depend on each nebula's age and the angle to our line of sight. Astronomers now also understand that a planetary nebula forms when a Sun-like dying star begins emitting shells of gas from its core. (Astronomy, January 2010)

Cosmology's Greatest Discoveries, and New Research. A summary of some of the great discoveries, including how galaxies evolve, the spinning nature of black holes, and the powerful effects of gravity. Continuing mysteries remain unresolved, including dark energy and how it accelerates cosmic expansion, the shape of the universe, and how matter came to edge out antimatter in the evolution of the universe. (Astronomy, Special Collector's Edition, January 2010)

High Definition Lunar Landscapes. Dramatic and highly detailed views of lunar features obtained by Japan's Kaguya spacecraft mission, a lunar orbiter launched in September 2007. (Sky and Telescope, February 2010)

Focusing on Mars. A set of articles about the red planet, including climate changes in the past, the travels of the two NASA robotic rovers during the past six years, a re-examination of the Viking soil test experiments of 1976, what the two small moons of Mars can tell us about the planet's past, and some preparations underway for an eventual manned mission. (Astronomy Now, February 2010)

The Top 10 Stories of 2009. The most important discoveries of the year - including new evidence of the mysterious dark energy, the restoration of the Hubble Space Telescope, the discovery of water on the Moon, many additional extrasolar planets found, and cosmic rays

accelerated by supernova remnants. (Astronomy, February 2010)

Analysing the Weather on Extrasolar Planets. With the increasing discovery of extrasolar planets, and some of these seen in transit across the parent star, it is now possible with spectroscopy to analyse the atmospheres surrounding some of these planets. (Astronomy, February 2010)

Results from NASA's latest Gamma-ray Space Telescope. The detection of gamma rays from cosmic sources was more difficult than expected, but with the launch in 2008 of the Fermi space telescope scientists have been able to detect gamma ray sources in active galaxies, and keep watch on pulsars and flares from massive black holes in some of the most distant galaxies. (Astronomy, March 2010)

The Landscape of Saturn's moon Titan. During the five years that the Cassini spacecraft has been focusing on Titan during flybys, much has been discovered about its atmosphere and almost Earth-like landscape. Titan has mountains and river channels, large dune fields, lakes of methane and a weather cycle. A summary of findings includes some of the detailed images obtained. (Astronomy, March 2010)

Spiral Galaxies. Most spiral galaxies, like our own Milky Way system, have two main spiral arms and a bar of material at the centre. A set of articles describes the main features of spiral galaxies and different types, the large cluster of galaxies spread across the boundary of the constellations Virgo and Coma Berenices, and how groups of galaxies are drawn together by gravity. (Astronomy Now, March 2010)

From Galaxy Zoo to the Zooniverse - the Rise of the Citizen Scientist

Lecture by Dr Arfon Smith
Department of Astrophysics at the University of Oxford

Monday 17th May 2010
6.00 pm at St James, St Peter Port

Tickets: £10.00, Students free, unreserved seating.

Tickets available from the St James Box Office
or OUS Guernsey Branch, e-mail: guernsey@ousoc.oxon.org

How can astronomers analyse large volumes of observations? What role is there for the interested lay person in this work? How a quarter of a million people helped classify over 100 million galaxies!

Dr Arfon Smith will give an illustrated talk covering a range of current and future citizen science projects that rely on members of the public to analyse scientific data. He will also describe some of the serendipitous discoveries made by members of the community and how anyone can contribute to real scientific developments.

Exhibition

Guernsey Heroes of the Royal Society

1st April to 25th June 2010
Priaulx Library Candie Gardens

Illustrations, publications and surviving artefacts will feature the work of ten outstanding Guernseymen who were Fellows of the Royal Society, and several others who had some association with the Island.

The Raymond Falla Memorial Lecture:
Guernsey Heroes of the Royal Society

Amanda Bennett
Chief Librarian, Priaulx Library
&
David Le Conte
Chairman, WEA Guernsey

Thursday 13th May 2010
8.00 pm at Les Côtils Centre

This illustrated talk will describe the lives and work of Guernsey Fellows of the Royal Society, whose researches covered many disciplines, from astronomy to medicine, from geology to naval inventions. They are men whose contributions to science were recognised nationally and internationally, and who brought credit to their Island.

Astronomy Section Officers

Secretary	Debby Quertier	725760
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Editor	Colin Spicer	721997
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Research	Frank Dowding	255215
Light Pollution	Vacant	

Observatory

Rue du Lorier, St Peters,
Guernsey
Tel: 264252

Web page

www.astronomy.org.gg

Material for, and enquiries about Sagittarius should be sent to the Editor

Colin Spicer
60 Mount Durand, St Peter Port
Guernsey GY1 1DX
Tel: 01481 721997
colin.spicer@cwgsy.net

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La Société Guernesiaise, Candie Gardens, St Peter Port, Guernsey GY1 1UG.
Tel: 725093