Sagittarius

The Newsletter of the Astronomy Section of La Société Guernesiaise

October – December 2008

Forthcoming Events

Astronomy Section Christmas Meal

9th December: 8.00 pm
La Barbarie Hotel

(to be confirmed)

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

Forthcoming Visits to the Observatory

We seem to be popular at the moment as I have had a number of requests for visits. Dates that have been agreed so far are as follows:

Group	Date	Time	
Scouts	Wednesday 8th October	7.15 pm	
Police Club	Tuesday 4th November	8 pm	
Police Club	Tuesday 11th November	8 pm	Police Club members wishing to attend may exceed 50 people hence 2 evenings required.
La Societe Junior Section	Thursday 6th November	7 pm	This visit is to promote the new Junior section of La Societe Guernesiaise and if cloudy then we will need to arrange slides and talks.
Brownies	Wednesday 19th November	6.15 pm	
Brownies	Monday 24th November	6.30 pm	
9th Guernsey Scouts	Wednesday 7th January 2009	7.30 pm	
St John's Volunteers	Friday 6th February 2009	6.30 pm	

The two visits in 2009 are a little after first quarter but before the full moon. I do feel, for the younger groups, that showing them the moon, even if it is around full, is quite exciting. Despite many of us having seen the moon many times in a telescope, there is still a 'wow' factor which our young visitors appreciate.

Visits by Scouts and Brownies usually last for about one and a half hours, which is the normal time of their meetings.

There are five visits for November. I am keeping December completely free as I know everyone will have other commitments so any further requests I will arrange for January and February but will avoid clashing with next year's Workers Education Association course.

Our first visit of the winter season was St John Ambulance Volunteers and whilst the sky was not perfect, we were able to show them various objects as the partial cloud cover permitted. Let's hope we get some clear skies for the many children who will be visiting us during the coming months. If anyone can offer help on any of these nights it will be greatly appreciated!

Debby Quertier

Tunguska Revisited

It's a very special day today as I started writing this. It was exactly 100 years to the day, on 1908, June 30 that Tunguska in Siberia became famous. We're on a ship just off Estonia, a country not many people know or visit that contains the largest meteor crater in Europe at Saaremaa. A few days before we'd landed in Tallinn but unfortunately the itinerary didn't allow enough time for trips to visit this massive crater. Why is this part of the world of such an interest to us resident in our small Bailiwick?

It’s very simple, really. The Estonian impact, had it happened here would have completely obliterated all life and traces of our presence in all the Islands in the whole of our St Malo bay area. But that's not why today was so relevant. It was exactly a hundred years ago that something just as cataclysmic hit the Earth and a great mystery started. Even today nobody is entirely sure what happened that June 30th morning.

What is very clear is that an alien spaceship or similar didn't crash land. Nor was it some man-made explosion of huge proportions. We can be very sure it wasn't some military experiment that went wrong because this event occurred in the decade before WW1, with the technology to make such huge holes in the ground not even achievable then. Those fearsome mines dug under enemy trenches in WW1 made minute craters by comparison, as I can confirm from seeing remains of the explosion craters near the Somme. Nuclear technology was some four decades into the future; nobody, apart from a few native villagers lived or worked in that harsh Siberian environment anyway.

At around 07.15 on that mid-summer's morning the huge explosion occurred. Eyewitnesses saw a large smoke trail and the explosion is judged to have happened at around 16km altitude with another estimate of a force equivalent to around a thousand times that devastating Hiroshima. An area some 2150 square kilometres was laid waste. That something massive had occurred was noted in seismic stations around the world. That's not much to go on as scientific evidence because nobody took any real interest because whatever it was wasn't in their backyard, very much a case of "out of sight, out of mind". Siberia was as inaccessible as Antarctica and the time was still a few years before Scott and Amundsen.

Those figures have been reconstructed, but still based on nothing more than ground data and seismic records from two decades later when a scientific expedition did finally reach the spot. Leonard Kulik was a mineralogist by profession, hoping to find some iron from the meteorite. Instead of a crater he struggled through some 20 kilometres of utter devastation to find a most odd 'ground zero', today's modern expression for the epicentre.
Instead of a great hole there were still standing trees, which he described as

appearing like telegraph poles, that is to say bolt upright, without vegetation, mostly without side branches, with an extra eerie dimension of being scorched. There was some re-growth of undergrowth vegetation, surprisingly little, but all around the expected epicentre most of the trees were flattened and pointing outwards.

That observation is our first mystery- why are trees still upright at the epicentre and not all flattened, or more significantly, obliterated and splattered to the wide horizon? The later conclusion is the modern and accepted one that the main explosion was at some altitude above. There is an interesting explanation for this phenomenon.

At a recent Society for Popular Astronomy meeting some pictures of the nearby site were shown with trees appearing to have fallen into a crater (actually a slope some distance away), but lying down towards the epicentre, not up as would be expected from an explosion passing over. The explanation from the audience was equally interesting. It seems that when a major explosion occurs, it's not the main pressure wave that does the damage but the ensuing vacuum created as it passes. Trees aren't blown over under these conditions, but sucked out of the ground, and/or pulled back into the vacuum. People are killed in buildings by that negative pressure surge.

Thus, an explosion at altitude can be and is more deadly. However, it just doesn't explain some of the other mysterious site features. Top of the list is the absence of a true crater that would be expected even from atmospheric explosions.

It was another decade before Kulik mounted another expedition, this time from the air. He did identify something, the huge area of flattened tress but no obvious crater that could fit the bill and there the matter rested until fairly recently, adding a lot of ammunition to the famous conspiracy theories, ET visits and so on. Perhaps the most bizarre idea put forward has been the one about a black hole colliding with the earth (or more specifically its atmosphere). That sort of nonsense has re-emerged in recent weeks when the Cern Large Hadron Collider started operating. The only evidence for something from space was a higher than average soil content of iridium, together with some minute glassy spherules, and another element in high traces, nickel. All three factors are good pointers towards a meteoritic impact.

All Kulik had spotted was a desolate area of Siberia with all its attendant problems of access, something useful in itself as that definitely confirms no human activity could have caused the explosion. It took a fully modern expedition in the last year to identify a small lake called Cheko that was close enough to the expected epicentre. This hadn't been seen on maps until the 1929 expedition, presumably because it had taken those intervening years to fill.

All modern hopes of finding something are based on this new site and after all this time and delay our expectations cannot be too high. Not only will the geologists have to penetrate some 50 metres of water, but also another 20 metres of solid lake bottom to get at whatever has been identified as suspicious! Adding to this the weathering and water solubility problems derived from a century makes this a very high-risk operation.

Then one has to add in doubts on the site of the lake, some 8km away from the epicentre. The only factor in its favour is a position in direct line past that epicentre, on the supposed track of the incoming body.

Until cash is raised to mount a full study and survey, our ground Tunguska mystery site will remain just that. Where does this leave us? Open season for speculation, it seems.

Let's return to the main ideas in that speculation. Top of the list has to be an incoming meteorite or comet. Today we know that both are possible from many studies of craters and from satellite encounters in space. We can immediately rule out a metallic body because they don't normally break up and disappear in a big explosion before reaching the ground. Stony and icy bodies, and that include cometary nuclei, can and do. These days we now know there is no real difference between a comet's nucleus and some asteroids. The reader can make their own decision on which type or description they prefer.

My money would be on a comet as steam produced from an "icy snowball" has some enormous explosive power, quite out of expectation from a consideration of mass alone. There would also be relatively little solid left to find. Controlled steam explosions powered our Industrial Revolution and uncontrolled ones led to Chernobyl's downfall, and we all know about Krakatoa and the even bigger Santorini that wiped out much of the Minoan Civilisation of the time. The big snag with confirming an explosion due to an incoming body is the lack of enough credible eyewitness accounts at the time. It was years after the event before these were properly collated from locals and we all know the unreliability of court witnesses, even under oath, describing what they saw even a few hours later.

My doubts on the incoming trail of smoke are just that. Was it, in fact, an explosion on the ground? Sound travels (in round figures) a kilometre per second. That means that unless one actually sees the object coming in, a column of smoke seen a minute or more afterwards will already be distorted due to winds and other factors and one simply cannot tell in which direction it originated. If the reports seeing a flash are correct, that supposition is less tenable, but doubt must still remain on the direction of travel if the fireball was moving upwards.

Reports of the way the sound moved, as proof of downward travel are also suspect. Although I was living in the vicinity, and heard WW2 V2s land, at

that age I cannot recall the characteristic sound many spoke of at the time. "A big bang, and then the 'thing' went..". This is exactly what one expects from a supersonic body coming at you. Sounds became distorted from a distance and you cannot be confident which or what is the correct direction of travel. A century ago, and at the time of the initial studies in 1929, the concept of massive bodies travelling faster than the speed of sound was somewhat alien.
There is another intriguing possibility that's being actively studied, that of a ground explosion.

Tunguska might just have been due to a gas explosion on a massive scale. Late June is the hottest part of the year with sunlight nearly 24 hours long. The supposition is that sufficient methane might have been liberated from the boggy ground there and accumulated in the natural hollows, now thought to be the epicentre and lake depression. Whilst this is an intriguing idea, it's difficult to see how much gas could accumulate to devastate trees up to 50km away.

However, recent natural gas tanker trains in Russia, travelling from a region not all that far away caused an unbelievable amount of damage when they exploded. I'm drawn to that possibility from a simple comparison of the two types of incident.

The trains released pure gas into a very small volume before detonating. Although tragic, the explosion is not as massive as theory because it arose from a gas-rich mixture with air, just as the Hindenberg Zeppelin burnt and didn't explode as most people still say. If a natural accumulation occurred over days or weeks, then we get a perfect explosive mix that will generate much more power, and probably lead to a chain reaction of such accumulations. Coal mines are very prone to that type of sequential event. The initial firedamp explosion throws coal dust into the air and it's that secondary explosive mixture that does the real damage. Dust explosions in factories have wiped out whole towns.

In high summer a small gas explosion could, just, disturb enough dry pine needles on the ground and turpentine vapour from seared trees to start a much more powerful secondary blast. Just a possibility, I think, before plumping for a comet as most think it was.

It is just this sort of air + vapour mix that made the famous "Daisy Cutter" bombs so nasty in Vietnam. A few tens of kilos of hydrocarbon created a crater some hundreds of metres across. They are effectively banned in warfare because the explosive power comes close to nuclear, and clear vegetation in a curiously similar way. It's the ensuing vacuum that does the damage.

With that intriguing thought I leave the reader to draw his or her own conclusions and query the Internet for more information.

Michael Maunder

Cinema under the stars

On Saturday, 19th July CineGuernsey showed the film *In the Shadow of the Moon* under the stars at Candie Gardens, to coincide with the anniversary of the Apollo 11 Moon landing. This exceptional film is an account of the Apollo space programme, told by the astronauts who took part in it. I had previously seen it on television, and can strongly recommend it.

Unfortunately, we only had two days notice of this event, so could not include it in the last newsletter. We did circulate it to the email list of members (if you are not on this list please let the Secretary know your email address). However, I was the only member who could attend.

The evening started in the lecture theatre, with a series of short films made by Channel Islanders. CineGuernsey had invited us to participate, and I gave a ten-minute talk (called *Throwing Light on the Moon*), about the Moon's complex motion, photographs of the trans-lunar injection of Apollo 8 which I took in December 1968, my acquaintance with Apollo 11 astronaut Michael Collins, who features in the film, and publicised our open evenings. I also showed stereoscopic pictures of the Moon, taken by Guernsey-born Warren De La Rue in 1858.

Then, as darkness fell we all moved outside, and sat on the lawn in perfect conditions to watch the main film. An introductory talk was given by the Producer, Dr Duncan Copp. As the film started the real Moon rose, red and magnified over Sark. Later, I used a laser to point out the International Space Station passing over, and as the film finished an Iridium flare could be seen.

It was a magical evening, made all the more enjoyable by a glass of champagne and a picnic on the grass. I understand that CineGuernsey runs these *Cinema under the stars* events every year, and I whole-heartedly recommend them.

David Le Conte

Comet Donati

Exactly 150 years ago the most spectacular comet of the 19th century appeared in the north-west sky, its tail pointing almost exactly towards the Pole Star. Comet Donati caused a major stir, and its sighting was reported in the Guernsey *Star*.[1] The *Illustrated London News* went so far as to speculate that, far from causing bad wines, comets might actually improve them, although how it was at a loss to say.[2] Another publication said: "*Comets were once supposed to portent war. We need have no fears of this one, for the Great Bear, Major*

Ursus of the celestial host, has it already under his foot." [3]

Guernsey-born Warren De La Rue, attempted to photograph it with his 13-inch reflector from his observatory at Cranford in Middlesex. Had he succeeded he would have been the first person ever to photograph a comet (a feat accomplished by a commercial photographer and artist named W Usherwood, in England, and G P Bond of Harvard). However, a 60-second exposure on his collodion plates failed to produce an image. He attributed this to the low altitude of the comet at the time.[4] The death of his mother, and his departure on a two-month business trip to Russia, prevented him from further attempts.[5] He did, however, sketch the comet, and sent it to Sir John Herschel, but his sketch is missing.[6]

Donati's Comet seen from Greenwich Park, London, 17 September 1858 (*Illustrated London News*, September 25 1858)

The comet was one of six discovered by Giovanni Battista Donati, who worked at the Observatory of Florence. It reached perihelion on 30 September 1858, and its closest point to the Earth on 10 October. It had a curved dust tail and two gas tails, together with multiple haloes probably

caused by a hot spot ejecting material while the comet was rotating. Its aphelion distance is calculated at over 300 astronomical units, and its orbital period almost 2000 years.

David Le Conte

References

1. *The Star*, 14, 16, 21 September, and 7 October 1858.
2. *Illustrated London News*, September 25, 1858.
3. *Robert Merry's Museum*, October 1858, p122.
4. Monthly Notices, Royal Astronomical Society, volume xix, page 138.
5. Letter from Warren De La Rue to the Astronomer Royal, George Biddell Airy, 5 October 1858 (Royal Greenwich Observatory archives, RGO 6/169, leaf 563).
6. Letter from Warren De La Rue to Sir John Herschel, 15 September 1858 (Royal Society archives, HS6, D142).

Opera, Equinox and the Full Moon

I receive many queries of an astronomical nature, but one of the recent was most unusual. Dr Andrew Lawrence-King, the very talented Guernsey-born musician of early music, emailed me from Helsinki to say that he had just finished a production of Hidalgo's *Celos aun del aire matan*, the earliest surviving Spanish opera (1660) at Sheffield University. In Act II of the opera, there is a scene set in the Temple of Diana (the Moon-goddess). According to the libretto, the scene takes place on the Spring Equinox, which coincides with the Full Moon. He noted that by happy coincidence, this year, 2008, there was a Full Moon on March 21st.

He asked whether it was a rare event for the Equinox and Full Moon to coincide, and did it happen in 1660, or a year either side (as the precise date of the original performance is uncertain). He wondered whether I could throw any (moon) light on the subject. He referred to a NASA website, which, he observed, showed that there was indeed a Full Moon on March 21st in 1660, and said that he had been told that the full moon and equinox coincide about every 26 years.

I replied that unfortunately the website he quoted was for BC dates, rather than AD. I referred to the correct website, which agreed with software (SkyMap 10) calculations of moon phases and equinoxes (in the Gregorian calendar, which Spain adopted in 1582):

Year	Full Moon	Equinox
1659	March 08	March 20
1660	March 26	March 19
1661	March 15	March 20

So the match is not very good for any of these years.

This year, 2008, the Full Moon was on 21 March, but the Equinox was on 20 March. The equinox fell on 21 March last year, but will not fall on 21 March again until 2102.

The interval between successive Full Moons (the *synodic month* or *lunation*) is 29.53059 days. The length of the year in the Gregorian system is 365.2425 days. Therefore, there are 365.2425 / 29.53059 = 12.368276 lunations in a year, and the date and time of the Full Moon slips by an average of 29.53059 x 0.368276 = 10.87542 days per year (or 10 days 21 hours 01 minutes per year).

Examination of the Moon phase tables show that on no occasion this century does the Full Moon fall on the day of the Spring Equinox (although it does come close). I think this is just chance, and there are probably other centuries when it happens several times.

In the 17th century, the Full Moon fell on the Spring equinox in 1609, 1647, and 1666, but was only one day out in 1628, 1636, 1639, 1658, and 1685. The 1658 date is close to the period of interest. The Spring Equinox was on 20 March 1658 (at 10.04 am), and the Full Moon was on 19 March 1658 (at 10.25 am). These are based on strict astronomical definitions, but such fine distinctions would not be apparent to a non-astronomer. It is conceivable, therefore, that Hidalgo used the concept of the Full Moon occurring at the Equinox based on the coincidence of these two events in 1658.

Incidentally, I visited the temple of Diana (Artemis was the Greek equivalent) at Ephesus last November. Unfortunately, almost nothing is left of this edifice, which was one of the seven wonders of the world, the stones and marble having been carried away over the centuries and incorporated in other buildings. One piece ended up in our own Town Church, where it was used as a memorial.

David Le Conte

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

The Tunguska Event. The massive aerial blast over the Tunguska region of Siberia a hundred years ago, on June 30th, 1908, is still the subject of investigation. No traces of the suspected asteroid or comet fragment were found, but it is now thought possible that a small lake not far from the central area of devastation may provide further evidence. (Astronomy Now, June 2008)

Identifying Supernova Stars. The types of stars which may explode as a supernova may be predictable, but after the event it is only the use of previously obtained high resolution images of galaxies which can help to identify these particular stars. Reflected light echoes from long disappeared supernovae can now also be identified. (Astronomy Now, June 2008)

The Evolution of Galaxies. Observations using the Hubble Space

Telescope have shown that massive galaxies already existed in the early history of the Universe. This has led to a major change to the previously held 'hierarchical' theory of galaxy mergers in the early Universe. (Astronomy Now, June 2008)

Kristian Birkeland and the Northern Lights. The story of how, a century ago, Norwegian scientist Kristian Birkeland discovered the cause of the Northern Lights - that charged particles from the Sun reacted with the Earth's magnetic field to produce the glowing aurora. (Astronomy Now, June 2008)

Mars Phoenix Landing. The latest Mars spacecraft arrival, including an image of the actual descent, obtained by the Mars Reconnaissance Orbiter and after landing in the northern polar region. (Astronomy Now, July 2008, and Sky and Telescope, September 2008)

Emanations from the Sun. A set of articles focusing on solar activity, including the solar wind of charged particles, solar activity and eruptions, and the effects on Earth including the observation of auroras. (Astronomy Now, July 2008)

Top 10 Discoveries of the last 35 Years. A special issue of Astronomy Magazine to mark 35 years since it was first published. The most important discoveries in recent times include the existence of 'black holes', the discovery of planets around other stars, and dark energy speeding up the expansion of the Universe. (Astronomy, August 2008)

Water Worlds of the Solar System. Several icy moons in our solar system show clear evidence of sub-surface water. Jupiter's moon Europa has apparent ice floes, and the larger moons Ganymede and Callisto are both thought to have water deep below their crusts. Several of Saturn's moons including the major moon Titan are also thought to have water layers. (Astronomy Now, August 2008)

The Gamma Ray Universe. A set of articles focusing on gamma ray astronomy, including gamma ray bursts, black holes and quasar jets; gamma rays in our own Milky Way system; interactions in our atmosphere creating gamma rays, and technology which has now allowed the detection of these high energy rays. (Astronomy Now, August 2008)

Phoenix Mars Lander - Ice confirmed. The Mars Phoenix spacecraft landed on May 25th, much further north than previous landers, and a trench dug in the soil by the craft's robotic arm has confirmed the presence of ice. (Astronomy and Space, August, 2008)

Extraso1ar Planets - Update. The number of planets now known to be in orbit around other stars has now passed the 300 mark. An update of recent findings including the possibility that the closest stars to us - the binary system of Alpha Centauri, with Sun-like stars, may also contain planetary companions in orbit. (Sky and Telescope, September 2008)

Mapping our Solar System and the Galaxy. From maps of our solar system's planets and moons to the mapping of our Milky Way galaxy. How mapping has been achieved from space probe photography and radar techniques, and with more accurate maps of our galaxy also becoming available. (Astronomy Now, September 2008)

Hubble Space Telescope - Final Servicing Mission. Details of the final mission to service and upgrade the Hubble Telescope, and due to be launched in early October. The aims will be to extend the HST's life by at least five years, replacing and installing new equipment, including a spectrograph designed to study very distant galaxies. The telescope continues to make significant discoveries, recently identifying methane and water in the atmosphere of a planet orbiting a star in the constellation of Vu1pecu1a. (Sky and Telescope, October 2008)

Rocks from Space. Meteorites are found to be of several major types, including stony and metallic specimens, and have different origins. A guide to identifying and owning a piece of ancient material from outer space. (Sky and Telescope, October 2008)

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