From a scientific point of view, the transit of Venus made 1882 a significant year but it was also the year that La Société Guernesiaise was founded as a scientific society with interests and aims in conservation and history. At that time the Astronomy Section did not exist and was not to do so until the 1970s but in 2004 the members of the Astronomy Section will meet to watch this special event, as will many other astronomers. Let us hope that the weather does not fail us and we are able to watch this memorable event whilst enjoying the sunshine.

The most important thing to remember for the coming transit, is that it is never safe to look directly at the Sun. The transit has been compared to an eclipse of the sun so remember all the safety warnings of 1999!

Debby Quertier

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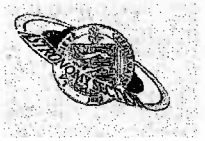
Sagittarius

The Newsletter of the Astronomy Section of La Société Guernesiaise



April – June 2004

Forthcoming Events

Comet NEAT closest approach 21st May

Transit of Venus
8th June

Viewing Programme:

April – Moon
May – Double Stars
June – Transit of Venus

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 first three months of 2004 have been particularly busy. Our annual AGM was held in January (see Minutes). Once again this quarter cloudy nights have dominated on Tuesday evenings much to the detriment of our viewing programme.

We have had several visits from Scouts and Brownies, regrettably some groups encountering cloudy skies, but we have managed to show them a few objects albeit through intermittent cloud cover. Talks and computer presentations have supplemented poor viewing and these have been well received.

The WEA course began on the 5th February, a week later than previous years. The successful format has not been changed. Unfortunately this year's group has been unlucky with the weather. Due to bad weather we postponed the final night to one week later which, fortunately, was a beautifully clear night and we were able to show the many objects that we had promised. We aim to repeat the course in 2005.

The first open evening of the year, 24th February, was planned to have a different theme. The aim was to use the smaller telescopes that we have and let youngsters have a go for themselves. The night was selected with a young moon and Jupiter and Saturn visible, all easy to find in the telescope. Once again the weather was cloudy but despite this over 50 people turned up. We will attempt to repeat this 'hands on' event later in the year.

On the 9th March a group from NRG visited and there were good skies for the first part of the evening but then clouded over so David Le Conte gave them an impromptu computer presentation. He showed them the latest news on the discovery of Sedna, classed as the '10th planet' by the media, re-opening the debate about what actually constitutes a planet.

Open evenings of 16th March and 30th March both had good skies and we had good numbers. Our final group this quarter was St Andrews WI and they had a combination of viewing and a talk by Jessica Harris. Whilst we were outside pointing out various constellations we again saw a group of three satellites in triangular formation (thought to be for shipping navigation). They look like three stars sliding across the sky - a strange sight.

Mercury has been visible low in the west for the latter part of March, joining Venus, Mars, Saturn and Jupiter and stretching in a line in the sky from west to east. As the young moon appeared in the west it has made a nice grouping, being first close to Mercury, Pleiades and then Venus.

We plan to spend evenings that we are not open to the public practicing with the CCD camera. This has been neglected this quarter as a result of being busy with visitor groups and poor skies. We may also take advantage of clear Friday nights.

This summer, in advance of the weekly public evenings, we are aiming to have another display in the building, as we produced for Mars last year. This year's theme will be the Solar System and key objects that we will show during the summer nights such as M57. We hope to acquire at least one more computer as the Starry Night planetarium program is popular for 'hands on' usage and I have recently bought another program which may prove to be entertaining and informative. Ideas are always welcome for open evenings and if anyone has any suggestions please let me know.

Debby Quertier

AGM Minutes – 27th January 2004

Present: David Le Conte, Colin Spicer, Geoff Falla, Peter Langford, Debby Quertier, Jessica Harris and Frank Dowding

Apologies: Bert Ozanne.

Election of Officers
All Officers were re-elected excepting Daniel Cave who has been resident in the UK for some time now. Geoff Falla takes on the role of librarian assisted by Debby Quertier.

Treasurers Report
Peter Langford presented the accounts to the year ending 31st December 2003. The section has healthy funds, though our capital is reduced from £4,300 to £2,600 due mainly to the purchase of the CCD camera. Our fundraising was higher than 2002 and the open evenings throughout the year had netted a good income.

Thanks were expressed to the treasurer for the clearly presented accounts.

Equipment
Cloudy skies throughout the winter has limited very much practice with the CCD camera. From experience to date it appears to work well on faint objects. Further experience is needed and we should dedicate spare clear Tuesdays to its use. It was agreed that we need a computer for use solely with the CCD. We may be able to acquire redundant office PCs but if necessary we should consider buying a new one. A laptop could be used as a temporary measure. It was agreed to discuss this again in a couple of months.

It was agreed to spend £200 to £300 on a new eyepiece for the Meade.

Light Pollution
There is a vacant position of Light Pollution Officer which will be advertised in Sagittarius. The Section will re subscribe to the Campaign for Dark Skies newsletter.

The new car park lights at the airport were discussed and we agreed to consider whether these worsened viewing at the Observatory.

Visitors and Groups
It was agreed to continue with group visits but we should prepare a talk/presentation for cloudy evenings. The Workers Education Association Stargazing course starts on the 5th February and it was envisaged would be repeated in 2005.

We were pleased with the funds received on the open evenings and discussed the approach for the coming year. One of us would meet and greet people, to take the entrance charge and collect money for 'shop items'. It was agreed that the entrance fee for public evenings would remain as £1 for adults and 50p for children. It was suggested that we produce a small handout for the open evenings with a simple sky chart and basic information concerning the objects on view. A new display is needed in the main building to replace last year's Mars display. The level of external lighting for open evenings was discussed. We need to maintain the balance between enjoyment of the night sky and safety of our visitors.

Details of our open evenings need to be circulated to a wider audience. The secretaries would get together and plan how this should be done.

Any Other Business
It was agreed that we should rejoin the BAA at a cost around £35 per annum.

The car park area needs some levelling and the owner may assist with this. Gorse needs cutting (some to be recycled for a Societe furze oven meal). The brightness of the car park lights needs to be reduced but the duration increased.

It was agreed to purchase two new heaters at about £40 each.

Buildings are in need of maintenance. We will use the longer evenings for maintenance and have a clean up day for painting jobs.The doors are being replaced and it was agreed that a good quality lock should be obtained together with directly bolting the hinges to the wall for greater security. A skip will be required on clean up day.

A viewing programme for 2004 is underway. We discussed the possibility of undertaking research through the BAA and it was agreed to contact them.

Ideas for the magazine were raised including a letters page and welcoming new members to the section. Frank Dowding agreed to do another talk later in the year, the subject to be decided. We agreed to publicise the talks more widely.

Thanks were expressed to Geoff Falla for organising coffee supplies.

Debby Quertier

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

Mars Landing Missions. Details of the three landing missions planned to begin investigations on the planet's surface from the beginning of 2004, the British Beagle 2, and two NASA rover missions - with a summary of all previous attempts and successes involving flyby missions, orbiters, and landers.(Sky and Telescope, January 2004)

Digital Camera Photography. Some excellent results are being obtained using digital cameras for photography of the Moon and planets. The relatively short exposure times, with the camera held steady to the eyepiece of the telescope are all that is necessary. (Astronomy Now, January 2004)

The Most Active Solar Storm. The autumn of 2003 saw the highest level of solar activity with the most intense solar flare ever recorded - about three years after normal solar activity maximum. Further details and aurora photographs. (Astronomy Now, January 2004)

Pioneering Astronomers of the 20th Century. The names of many of the early astronomers are well known in laying the foundations of astronomy. During this last century our understanding of astronomy and the wider universe has continued to expand with new discoveries. The life and work of some of the most notable astronomers of this period, including Henry Russell, Sir Arthur Eddington, Harlow Shapley, Edwin Hubble, and Carl Sagan. (Astronomy Now, January 2004)

Cassini - Journey to Saturn. The Cassini spacecraft is due to begin orbiting Saturn in July after a seven year journey. It is also carrying the Huygens European space probe, due to land on Saturn's largest moon Titan at the end of the year. An in depth account of the mission and its objectives. (Astronomy, January 2004)

Space Travel is Utter Bilge. This article has as its title the words attributed to a former Astronomer Royal - just before the launch of the first satellites, and the beginnings of the Space Age. The dreams of space flight, and its pioneers helping to bring it to fruition.(Astronony, January 2004) .

Mars Rovers. The first of two Mars Rover spacecraft landed successfully on January 4th. The first image from the Spirit spacecraft which landed in the Gusev Crater area, thought to have once been a large lake. (Astronomy Now, February 2004)

Starspots. A summary of information about Sunspots and their cause, with a diagram of the activity recorded since 1874. The noted lack of Sunspots in the 'Maunder Minimum' period of the 17th century with the pronounced climate cooling at that time is an

indicator for predicted climate change. (Astronomy Now, February 2004)

The Greatest Astrophotos of all time. A selection of 25 of the best and most historic astrophotos, taken over the last 150 years. (Astronomy, February 2004)

Searching for Vulcanoids. It was once accepted that another planet,Vulcan existed in an orbit close to the Sun, following several reported observations which have since not been confirmed. There is, however, a stable orbit region close to the Sun where it is thought mini planets or asteroids may yet be found. (Astronomy, February 2004)

Life on Mars - the question that wont go away. The possibilities of life on Mars - and the uncertainty which still surrounds the soil tests carried out by the Viking lander missions in 1976. (Sky and Telescope, February 2004)

Transits of Venus - Yesterday and Today. On June 8th there will be a rare transit of Venus, the last one having been observed in 1882. A record of previous observations, and their importance in helping to determine the Sun's distance from Earth. (Sky and Telescope, February 2004)

Return to the Moon. Details of the plans announced recently by President Bush to increase spending on the NASA space research programme, with the aim of developing a new space vehicle, and returning to the Moon as a base for an eventual manned flight to Mars. (Astronomy Now, March 2004)

Space Weather - its effects on Earth. The environment of Earth and other planets is affected by variations in the energy emitted by the Sun. This can be seen in auroral displays near the Earth's polar regions, and more recently also photographed on Jupiter and Saturn. A set of articles on solar energy, effects on communications and climate, and on the Earth's magnetic field. (Astronomy Now, March 2004)

The Anthropic Principle's Resurgence. The argument that the universe is 'fine tuned' so that life was able to evolve has been discussed by some astronomers and physicists for many years, and is now receiving more attention. (Sky and Telescope, March 2004)

The Canals of Mars Revisited. Digital images obtained during the close approach of Mars last year have further confirmed that 19th century astronomers' claims of observing linear features on Mars were not a complete illusion after all. (Sky and Telescope, March 2004)

The Nuclear Space Race. New spacecraft are being developed which will be nuclear powered, and able to achieve previously unattainable speeds, but there are dangers. The development of nuclear power in space projects.(Focus Magazine, March 2004)

The Discovery of Helium

Helium is now known to be the second most abundant element in the universe. However, it was only discovered as recently as 1870. More curiously, it was not first discovered on Earth, but in the Sun. In fact Norman Lockyer, its discoverer, gave it the name helium from the Greek word 'helios', meaning sun. To discover a new element in an object as far away as the Sun seems impossible. How could it be done?

The story goes back to the early part of the 19th century when Josef von Fraunhofer, an optics specialist, minutely examined the spectrum of the Sun. Passing sunlight through a slit and then a prism he obtained a spectrum which he could inspect through a microscope. Using this apparatus, named a spectroscope, he surprisingly found that the spectrum was not a smooth gradation of colour but was interrupted by numerous black lines, now called Fraunhofer lines. By 1823 Fraunhofer had measured the positions of some 574 spectral lines, labelling the most prominent ones with letters of the alphabet. Sadly, despite his best efforts, Fraunhofer died without discovering what the spectral lines signified.
It was the German physicist Gustav Kirchoff who made the breakthrough, some three decades later. He was a professor at the University of Heidelberg. There the chemist Robert Bunsen was experimenting by heating substances using the now-familiar device named after him, the Bunsen burner. He was observing the colour of light given off by various chemicals and Kirchoff pointed out that he would be able to distinguish the colours better by using a spectroscope. When they examined a spectrum through the instrument they were astonished to find that it was crossed by a number of intensely bright lines. Furthermore they found that different elements gave different sets of bright lines, as if each element had its own unique spectral barcode. They looked at the spectra of many chemicals using this method and discovered two new elements, caesium and rubidium.

It was Kirchoff who thought to compare the flame spectra with that of the Sun. What struck him was that two dark lines in the Sun's spectrum corresponded to the two bright lines seen in the laboratory when the element sodium was heated. A few years previously the Swedish scientist Anders Angstrom had found that a gas always absorbs light at the same wavelength as it emits light. So, if a gas is hotter than a light source it will create a bright line in the spectrum; if it is cooler than the light source there will be a dark line in the same position. After some careful testing Kirchoff concluded that the relatively cooler outer atmosphere of the Sun must contain the element sodium. Kirchoff had thus shown that an element present on the Earth also existed in the Sun. The riddle of the Fraunhofer lines was solved. They were the signatures of all the different

atoms present in the Sun. In time Kirchoff was able to identify dozens of elements in the solar spectrum, including iron, calcium, carbon, silver, silicon, zirconium and zinc.

It was a remarkable result; firstly that one could tell the composition of a distant object and secondly that it was made of the same elements as were found on Earth. In principle, the technique of spectroscopy could be applied not only to the Sun but also to the stars. However, the light from stars was in general too feeble to examine through a spectroscope. The invention of the photographic plate opened up the field and an English amateur astronomer, William Huggins, spent a lifetime recording the spectra of hundreds of stars, each with their fingerprints of elements familiar on Earth.

Enter Norman Lockyer. He was a clerk at the British War Office and in 1862, at the age of 26, he built himself a six-inch telescope in his garden in Wimbledon. At first he used it for observing planets but he then moved on to using a spectroscope to study the solar spectrum. Of particular interest were solar prominences, filaments of gas around the Sun normally only visible during a solar eclipse. Lockyer reasoned that prominences, with only the cold of space behind them, should produce bright spectral lines which it should be possible to detect whether there was an eclipse or not. He needed a better spectroscope and had an instrument built. When he tried it out he did indeed see bright spectral lines from a solar prominence. In fact the same spectral lines had been observed a couple of months earlier in India by the French astronomer Jules Janssen, who also had the idea that prominences might be detectable at times other than during a solar eclipse. What both Lockyer and Janssen both noticed was a spectral line that they had not seen before. They each spent time in their respective laboratories heating up numerous different gases to try and identify the spectral line. By 1870 Lockyer was confident that he had exhausted all the possibilities and proposed that the element was one not hitherto known, and christened it helium.

We now know the properties of helium and can understand why it was not discovered earlier. Helium is a very light gas and any traces of it in the atmosphere soon float off into space. It is also very inert so does not react with other elements to form chemical compounds in which it might be detected. Most of the helium in the universe is created by the nuclear reactions which take place within stars. It can occur naturally on Earth, trapped in rocks containing a radioactive element such as uranium. When the radioactive element decays it emits an alpha particle, which is the nucleus of a helium atom. It was in such rocks that William Ramsay made the first discovery of helium on Earth, a quarter of a century after Lockyer's discovery of the element in the Sun.

Peter Langford

Further reading: "The Magic Furnace – The Search for the Origins of Atoms" by Marcus Chown (Jonathan Cape)

From 1882 to 2004 - A Transit of Venus

One hundred and twenty two years ago our knowledge of the universe was very different from that of today. Telescopes have improved significantly and as we see further into space our knowledge grows. The media recently has reported the discovery of Sedna, a planet-like body half the size of Pluto and orbiting many millions of miles further out into space. Our immediate neighbourhood is still growing and we have come a long way from knowing just the five 'wanderers' in the sky (the five naked eye planets) and the belief that the stars, sun and planets all were in orbit around our Earth. The invention and use of the telescope finally ended the belief in a geocentric system and led to the discovery of Uranus in 1781 and Neptune in 1846. Our knowledge of the planets was limited, we were a long way from sending probes into space but the thirst for knowledge was still strong and especially the question that is still unanswered today – is there life elsewhere in the solar system? In 1882 the Italian astronomer, Giovanni Schiaparelli was observing Mars and noting that there were strange linear features, which he termed 'canali' (Italian for channels). It was a few years before Percival Lowell mapped Mars and interpreted these channels as 'man-made' canals, but the curiosity and desire to know who or what may also live in our universe did not need much encouragement. Interestingly enough, a recent article in one of the astronomy periodicals has revisited these 'canali' and recent pictures of Mars do show some fairly straight markings. We now have a much greater knowledge of Mars and the many probes that have visited have shown that its surface is more like a bleak wasteland than a place where intelligent beings live. Nevertheless there remains the fascination with this mysterious red planet and despite 122 years of advancement in technology and learning, it still has the power to excite. Percival Lowell firmly believed there was another planet out beyond Pluto but it was not to be until after his death in 1916, that a young astronomer named Clyde Tombaugh discovered Pluto.

It wasn't just Mars that aroused curiosity, we wanted to know what lay beneath the thick clouds that covered Venus. Venus, named after the goddess of love, is the brilliant planet that shines either in the west after sunset or in the east before sunrise. We now know that this planet is probably the nearest thing we can imagine to hell! It is a scorching 400 oC, with an atmospheric pressure ninety times that at sea level on Earth, and blanketed under thick clouds of sulphuric acid - a truly nasty place. Probes that have managed to land on the surface and avoided being crushed long enough to send back pictures, have revealed a desolate landscape. Before the space age there was no knowledge of what might lay beneath those thick clouds.

The planet Venus is the connection between 1882 and 2004. This summer, on the 8th June there will be a transit of Venus, the first since 1882 and something that nobody alive today has ever seen; an event, therefore, that will create excitement in the astronomical community. The last transit was in 1882 and before that in 1874. Earlier transits occurred in years 1761 and 1769 and years 1631 and 1639, eight year gaps between each transit and over one hundred years between each pair. A transit occurs when the planet Venus (or Mercury, as happened in May 2003) is seen to travel in front of the solar disc over several hours. Consider an eclipse of the Sun, the events are similar, the disc of the moon is seen travelling across the disc of the sun, but as the two bodies appear to be the same size in the sky, the effect is quite spectacular. The transit of Venus occurs when the Sun, Venus and Earth are in a line, Venus in the middle then is seen crossing the Sun. The effect is not as spectacular as an eclipse but the disc can be watched as it crosses providing appropriate safety measures are taken. Venus takes 224 days to travel around the Sun and the Earth takes 365 days thus Venus takes approximately 8/13 of a year to complete an orbit. On this basis you would expect that the Earth and Venus line up with the Sun pretty regularly. In 1.6 years the Earth has orbited a complete orbit plus 3/5th orbit, whilst Venus has orbited two complete orbits plus 3/5th and so should meet up. Why is there not a transit once every 1.6 years? Comparison has been made to a solar eclipse and we could ask why is there not a solar eclipse every new moon, ie when the Sun, Moon and Earth are in a line. The reason is that the orbits are not in the same plane, so for the transit (or eclipse) to take place the three bodies must line up at the point where the planes of the orbits cross. If they do not, the three bodies will still be in line but Venus (or the moon) will be either above or below the Sun and there will be no transit (or eclipse). This explains why there is no transit of Venus each time it is lined up in between the sun and the earth but does not explain why we are looking at such a huge gap of 122 years between the forthcoming transit and the last one.

As we have stated, the Sun, Venus and the Earth line up once every 1.6 years, referred to as the synodic period. Imagine a clock face, divided into the months of the year rather than hours, and with a line drawn from the centre to the edge 3/5 of the way round, representing the first point in the orbit where the three bodies line up. Travelling anticlockwise and marking out each place where the bodies next line up and so on and you will end up with a five spoke pattern representing where each line up occurs, each position being 3/5 round the circle from the last one. In eight years the bodies line up five times, and then coming back to the starting point to line up five times in the next eight years. But because Venus actually takes a very small amount less than 8/13 of a year to complete one orbit, when eight years are up and it is repeating the pattern, it is not quite in the same place in the orbit as the first one. So if you continued to plot the line up positions on our circle you would still have the five spoke pattern but it would have moved very slightly clockwise and would be seen to do so as each set of line ups is plotted. Transits of Venus occur in pairs, eight years apart and the spoke pattern demonstrates the significance of the 8 year period but does not explain why there is such a large gap between the pairs. The transit occurs when the bodies are lined up but only when the planes of the orbits cross, which occurs in December and June. If a line representing the orbital planes crossing is drawn across our circle through June and December, you will see that the transits can only occur when our spokes meet up with the orbital planes crossing line. Hence the transits occur in pairs eight years apart, the first transit of the pair occurs just in front of the line ups meeting the orbit crossing line and transiting the south of the solar disc and the second occurring the other side of the orbit crossing line and transiting the north of the disc. The spoke pattern moves very slowly around our circle repeating in a 243 year pattern, two December transits eight years apart, a wait of 121 ½ years, then two June transits followed by 105 ½ years wait then it repeats itself. So we have the transit this June and then another one in June 2012, if it is cloudy on both these days then there is along wait until 2117 and then 2125, but unfortunately none of us will be able to wait around for them!

Whilst the transit of Venus may be visually interesting to watch, over 250 years ago, Edmund Halley, of comet fame, realised that if two observers watched a transit from widely separated latitudes they would be able to compare their observations and use them to calculate the distance from the Earth to the Sun. Each observer would time the transit from start to finish and the shift in the position of the planet would be used to calculate the distance. Expeditions were planned for the 1761 transit to different locations to record the observations and hopefully calculate the Earth to Sun distance but they had mixed success. There was one phenomenon that was noted that hindered accurate timings. As the disc of Venus entered and exited the solar disc a smearing effect was noticed and, as it was crucial to record the exact timings, this made it difficult to be precise. This effect was first thought to be due to the atmosphere on Venus, as the disc of Venus crosses on to the solar disc it appears to be joined to the limb of the sun by a dark area. The effect, called the Black Drop, is caused by refraction through the dense clouds of Venus and it makes accurate timings of the transit very difficult. However long after the 17th century transits, the recordings were subject to much scrutiny and calculation. In 1824, Johann Encke, also of comet fame as he discovered the comet with the shortest orbital period, reviewed all the measurements and came up with the Earth-Sun distance as being about 95,280,000 miles. This was greater than the accepted distance of 93,000,000 but was more accurate than any previous measurements.