Sagittarius

The Newsletter of the Astronomy Section of La Société Guernesiaise

October – December 2005

Forthcoming Events

Observatory Public Open Evenings

25th October 7.30 pm
8th November 7.30 pm

Mars (close approach)
End October/Early November

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

Apologies for Sagittarius being a little late this month but the plan has been to delay mailing until we have received the Astro Calendars which are due this month. So far there is no sign of them so Sagittarius may still be dispatched without them!

We had good weather for the Observatory Clean Up Day in July and managed to get a second coat of paint on all of the external walls. We had a good clear up inside and cleared much of the vegetation around the buildings and car park.

In addition to the clean up day, we have also had the guttering replaced on the main building. Debby's husband, John has once again put his skills to the task.

In fact weather was kind for observing for much of the summer. The open evenings were very well attended with clear weather for each of the Tuesdays. The Observatory Barbeque, held at the peak of the Perseid meteor shower, also went well with good numbers of meteors spotted.

There are two remaining Observatory Open Days on 25th October (during half term) and 8th November. Usually during the winter months we are busy with groups, such as scouts and WI, who want to visit us. Already we have had a group from the Hash House Harriers, a social running group who have traditionally held full moon runs and who thought, on this occasion, it was appropriate to see the moon through a telescope.

We weren't so fortunate with the weather for the partial solar eclipse on 3rd October as Debby's report describes. We did nevertheless manage to get a picture of the eclipse published in the Guernsey Press. The other major event this quarter is another close approach of Mars which is best seen at the end of October / beginning of November. Mars isn't as close as two years ago but it is higher in the sky so can be viewed in steady air.

The WEA evening class will be run again this February / March and already it is oversubscribed with more than ten people on the waiting list.

Whilst we hope for cold clear skies this winter, no doubt the practice of introducing questions for discussions on murky evenings continues. Our most recent concerned what is the periodicity of double stars and what are the factors affecting this. I will endeavour to maintain a list of questions for future publication.

Colin Spicer

Partial Solar Eclipse: 3rd October 2005

A few of us gathered at the Observatory on this Monday morning for what looked a promising day for eclipse watching. The solar mirrors were set up, the Celestron 11" had the special filters fitted and we had a selection of binoculars (and card for projection) on hand together with several pairs of eclipse viewers. Frank Dowding had set up his video recording equipment.

The day had started with us speaking on the early morning Radio Guernsey programme to give a short explanation of what we would be able to see, of course stressing the fact that it was not safe at any point of this partial eclipse to look directly at the sun. We did also speak later during the radio phone in to update on what we had seen. During the morning we had a visit from the Press, who took some photos and conducted an interview with us.

So what did we see? Unfortunately not a great deal. Things started well and a clear sharp image was projected onto the screen in the main building (which Frank was able to video). The first contact was seen at about 8.47 am and we then watched the small 'bite' taken out of the sun grow larger. Unfortunately not long after 9 am, the sky clouded over completely and nothing further was seen. During our short observation we noticed that there were no sunspots visible and we were able to see the rough edge of the moon, with its mountains and valleys. We probably saw only about 10% of the solar disc being covered and should have been able to about 2/3 rd coverage at maximum eclipse. Along the line of maximum eclipse which passed through northern Spain, Africa and out in to the Indian Ocean, watchers would have seen an annular eclipse of about 95% of the solar disc covered.

Oh well, better luck next time!

Debby Quertier

The Origin of Lunar Craters.

Anyone looking at the Moon through a telescope, especially for the first time, is bound to be amazed at the huge number of craters covering much of its surface. The craters are of all sizes, from the smallest pit-like features which can just about be seen, to the largest of the craters having a diameter of well over a hundred miles. The exception is where we see the large dark areas on the Moon, known from the earliest days of observation as the 'seas', now known to be smooth areas of solidified lava flows. In these areas there are far fewer craters, and those which are to be seen are mostly

small. The accepted explanation is that all evidence of the original craters was obliterated by the extensive flows of lava, with the remaining small craters being more recent additions.

The question usually asked by those looking at the craters on the Moon is - how were they all formed? We don't have anything similar on the Earth's surface, except in a few cases such as the impressive meteor crater in Arizona. The answer is that the Earth has a dense atmosphere with all of its effects, and weathering of the surface through the ages would have worn away the features of the original craters, apart from the geological activity which must also have been a major factor. In contrast, the Moon has no atmosphere of any significance, with less geological activity as it is smaller, and would have cooled down more quickly from its original formation. Meteor impacts from material left over from the formation of the solar system would have produced many of the craters on the Moon, and these would remain intact to be seen.

There is, however, evidence of some volcanism on the Moon, apart from the obvious lava 'seas' or more correctly the named 'mare' areas. The origin of the lunar craters has, in fact, been a subject of great debate. Patrick Moore, in his 1981 book 'The Moon' notes that while meteor impact is now generally accepted to be the main crater-forming process on the Moon, there are nevertheless features which can only be interpreted as being of volcanic origin.

Most of the Moon's craters are circular in shape, and craters which appear to be more oval in shape, particularly towards the edges of the Moon, are usually just an effect of perspective or foreshortening from the angle of view. It is accepted that the explosive effect of a meteorite would usually produce a circular crater, from whatever angle it arrives. A crater produced by volcanic activity could also be expected to form a generally circular shape.

A more important observation is that in virtually all cases the general rule is that where craters overlap, which can be seen in very many cases on the Moon's crowded surface, it is the smaller craters which break into the walls of the larger ones. This would seem to be the result expected, no matter how the craters were formed. Whether by impact or from volcanic activity, this would be expected to reduce over time in both cases. The impacts of large objects would be expected to reduce in size as remaining material from the solar system's formation was gradually swept up, attracted by the larger planets. Volcanic activity on the Moon would also have steadily decreased as the Moon cooled, so that any craters formed in this way would also have become smaller.

Meteor impacts on the Moon would be expected to have quite a random distribution, but it has been noted that some craters seem to be aligned, as well as the more obvious crater 'chains'. These are lines of small craters which may follow faults or

lines of weakness in the Moon's crust. The idea that these may be caused by a meteor breaking up just before impact seems more unlikely, particularly as the Moon has no atmosphere to produce heating effects on a meteor.

Lunar observers generally supported the volcanic interpretation of crater formation, especially perhaps when it was found that many of the craters have small mountain peaks at their centres. This seemed to be a major problem for the impact theory- first suggested by the German astronomer Gruithuisen in 1823, until the idea was suggested that the central peaks were produced by a rebound effect in the middle of the impact site. This concept then took hold, particularly in North America. On this interpretation, the craters without a central peak were judged more likely to be the volcanic ones.

It has been discovered, however, with better telescopes that some of the central peaks in the craters also have small craters at their summits, renewing the problems for the impact theory as a general explanation. Chance impacts which would occur only at the very top of these central peaks and not on the sides would seem highly unlikely. It is also worth noting that some of Earth's volcanoes have central peaks or cones in the course of continuing or renewed activity.

There is also an indication of continuing activity on the Moon, in the form of 'transient lunar phenomena'. This suggests that it may be rather more active than has been assumed. The reality of these transient events, as occasional glows and obscurations, were rejected in the past by many astronomers, until the observed gas eruption from the central peak of the crater Alphonsus in 1958, seen by N.A. Kozyrev: from the Crimean Observatory. The gas emission was then confirmed by spectral analysis, and seems to have been an important turning point. This indicated the volcanic nature of perhaps many of the central peaks in lunar craters.

Another curious feature seen on the Moon's surface and in some of the craters are small domes. These features are also highlighted by the astronomer V.A.Firsoff in his book 'Strange World of the Moon'. The domes are thought to be an indication of the last remaining volcanic activity on the Moon, from pockets of gas below the crust. With more activity in the past, it is possible that larger domes would have been the result of gas-filled magma, with the collapse of a dome forming a ring. This could have been a major factor in the Moon's earlier history of crater formation. As early as the 17th century, the astronomer Robert Hooke, a contemporary with Isaac Newton, suggested this crater-forming process from bubbles of gas in the lunar crust, which had burst to leave the features that are now seen. It has also been noted that some of the domes that are seen also have small craters on top.

During the Apollo moon landings,

efforts were made to identify signs of past volcanic activity on the Moon. Examination of the rock samples returned found that the Moon's highland areas seemed to be largely the result of impact events. The large smooth 'mare' areas have been confirmed as being the result of volcanic activity and extensive lava flows, but so far no other major evidence of volcanism seems to have been found.

The far side of the Moon has been more unknown, with only small parts of it being visible at favourable times as the Moon tilts slightly in its orbit. It is only since the introduction of spacecraft that the far side of the Moon has been photographed. This has revealed a different surface, compared with the Earth-facing side, with virtually none of the smooth dark areas and a generally rougher surface with very many craters. There are several prominent features, including the large crater which has been named Tsiolkovsky and has a dark floor with a central peak. This crater has been recognized as being a unique feature on the Moon's surface. There is also a huge ringed formation, the Mare Orientale, which has a diameter of about 600 miles. As described in the book 'Volcanoes and Impact Craters on the Moon and Mars' the author Piero Leonardi likens this formation to a volcanic caldera, the huge rings caused perhaps by successive collapse. It is more usually assumed that the formation was produced by a massive impact.

The question is why the prominent crater Tsiolkovsky, and the huge Mare Orientale should be at the same latitude, and located at the same latitude as the largest eruptive-type features on the major planets, and on Jupiter's moon 10, the most volcanically active body in the solar system - but that is another matter.

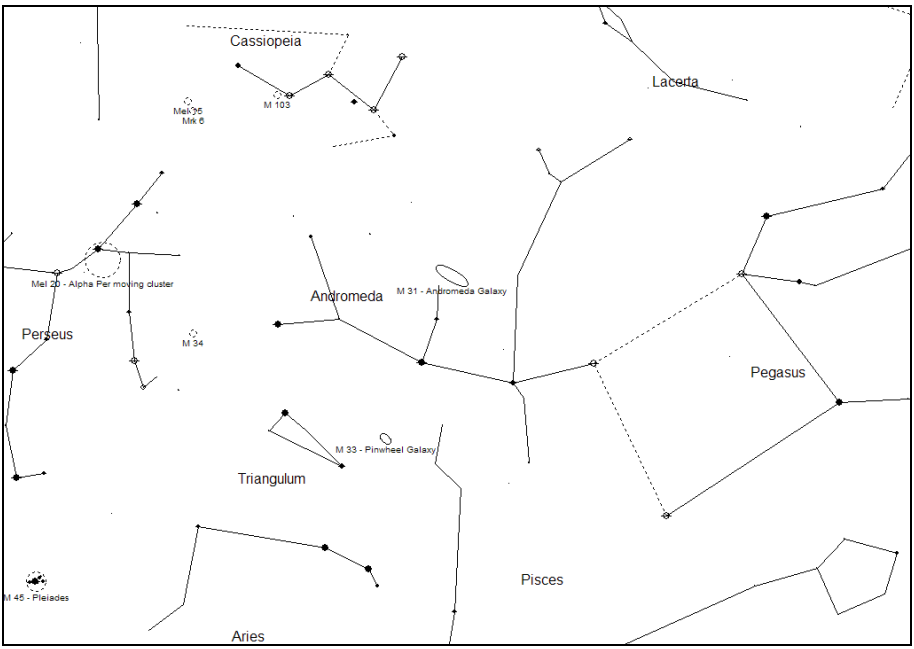
Geoff Falla

References:
The Moon. Patrick Moore. (Mitchell Beazley, 1981)
Strange World of the Moon. V.A. Firsoff. (Hutchinson & Co, 1959)
The Atlas of the Universe. Patrick Moore. (Mitchell Beazley, 1981)
Volcanoes and Impact Craters on the Moon and Mars. Piero Leonardi. (Elsevier Scientific Publishing Co. New York, 1976)

The Winter Sky
(with the Naked Eye and Binoculars)

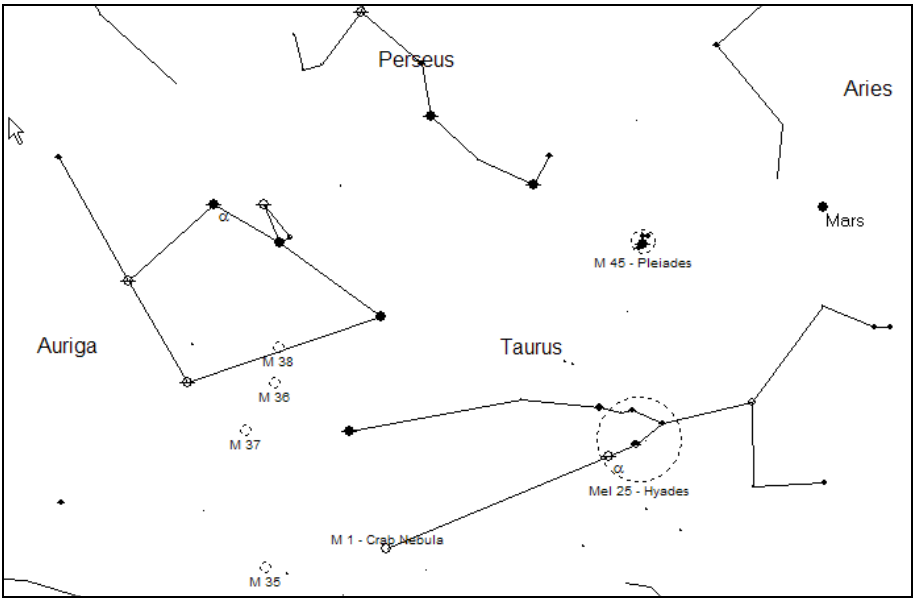
Since June/July, the sky has been dominated by the summer triangle and now, as winter approaches this dominant group is slowly moving down into the west. We are now starting to see the autumn and winter constellations which, I do feel, are richer in the variety of objects to been seen with a striking , variance of different coloured stars and brightness

in the sky. This is, of course, a matter of personal opinion but I have to confess that I much prefer the winter skies for several reasons but mainly because I feel Orion, and its neighbours, is the most appealing region of the sky. It is also probably one of the most easily recognisable constellations and can be referred to as a good starting point for beginners. In winter we also have the benefit of the skies being darker earlier - no more waiting until 10 pm for dark views! Also, I think we often get clearer skies in the winter with much less haziness. Nevertheless there are still gales, winter storms and arctic temperatures to contend with, but you can't have everything!



Looking eastwards in early October we see the large square (by now it is slightly on its side and is more of diamond), which forms the main part of the constellation, Pegasus, and is popularly referred to as the square of Pegasus. There is nothing really of interest here for the naked eye or binocular viewer but it is a useful pointer to the most distant object visible to the naked eye, M31 or the Andromeda Galaxy at a distance from us of 2.2 million light years. Although deemed a naked eye object, conditions do need to be reasonable to spot it, with binoculars bringing it better into view as a fuzzy smudge. The top left star of the square of Pegasus is actually a star in Andromeda, from which you move two stars along to the

left and up a little and there lies the galaxy. The stars of Andromeda make a line to the left of Pegasus and below this line there is a fainter triangle of stars, the constellation of Triangulum. Looking in a line below M31 and keeping this triangle to the left, your binoculars will come upon another galaxy M33. This is around 2.3 million light years away, another near neighbour and in comparison to M31 at magnitude 4.3, is merely magnitude 7, and a much smaller galaxy. Going slightly further northeast we then see the constellation Perseus as it is rising higher in the sky. The naked eye will see a double star cluster as a hazy patch between the sword handle and Cassiopeia (the wonky 'W'), whilst lower down in the constellation binoculars will spot M34, a 6th magnitude open cluster, 1400 light years from us.



In early October Mars is rising earlier and its red brightness is very striking. The planet will be at one of its closest approaches to earth and, as it will get quite high in the sky, will be well placed for viewing. A telescope will be needed to view any markings on the planet. Mars is currently amongst the stars of Aries, though fairly close to the Pleiades star cluster in Taurus (also known as the Seven Sisters or M45). The Pleiades is a hazy patch of very young stars and is better viewed through binoculars than a telescope which has too high a magnification to see the whole group of stars. Below the Pleiades is the older open cluster of the Hyades, easily spotted by their

distinct ‘V’ shape and the red giant Aldeberan, which are in the constellation of Taurus.

Regular observers of the sky will have noticed, since late autumn, a bright star steadily rising in the north, north east. This is Capella, the brightest star in Auriga and by January it will be overhead. Capella is one of five stars that make up a pentagon shape, the main part of Auriga. If you look within this area binoculars will show up some small fuzzy patches, M36, M37 and M38, which are all star clusters and which varying from magnitude 6 to 7.

Towards the end of October, after about 9.30pm you will start to see the body of Orion and in particular, if you have a good view towards the horizon, you will now see Betelgeuse, the red supergiant that is at the top left of Orion’s body. This massive star is bright, shining at magnitude 0.43 and, because you are seeing it low down, you will see it twinkle more and shimmer in colour. This effect would have been spotted earlier as Aldeberan rose in the east. A star appears to twinkle because its light has to travel though the earth’s atmosphere to reach us and the lower a star is the more atmosphere is has to travel though and thus the greater the twinkling effect. The apparent changes in colour are due to refraction of the stars light through the atmosphere. Similarly this effect can be seen with the red giant Arcturus when it rises again in the east next January/February. (Arcturus is now descending into the west ahead of the summer triangle).

By about 10 pm at the end of November, Orion is fully visible in the south east sky in all its glory. Objects to be found in Orion, and neighbouring sky illustrate various stages in the life of a star. Starting off in Orion’s sword handle we see M42, the Orion nebula, a cloud of dust and gases amongst which new stars are being born. The stars in this cluster are mere ‘stellar babies’. When the nuclear reactions at a stars core first switch on, the star is very hot and shines a blueish white colour. The stars of the Pleiades are older, though still relative youngsters and much hotter than our sun. Sirius, the brightest star in the sky, and easily identifiable in Canis Major, at the left foot of Orion, is also a youngish star. Look also to Rigel, the bright star at the bottom right of Orion’s Body. This star has the luminosity of almost 60,000 Suns and its size is 99 times the Sun’s diameter. Our Sun is about 860,000 miles in diameter and it is difficult to appreciate just how massive these stars are but if placed in our Solar System they would engulf the inferior planets. Fortunately Rigel is 777 light years away so no danger there! At the top left of Orion is the elderly red supergiant Betelgeuse, which is a lot closer to us, at less than 500 light years away. This star is over 1500 times the diameter of our sun but much cooler. It is in the latter stages of its life and has cooled considerably, swelling to giant proportions in the process, in fact it is now so massive that it is somewhat unstable and its brightness does fluctuate. Looking around this area of sky you can see

stars in the various stages of their life cycle and note the different colours which reflect their temperatures.

In the near future we should spend a clear evening exploring the sky with our binoculars to discover just how much can be seen. It would also be interesting to compare different size binoculars. As a rule of thumb 50 mm aperture is good for astronomy and that any smaller aperture may not have enough light gathering capacity. The magnification is finding the right balance between a useful magnification and one that you can hold steady. 7x50 or 10 x 50 are both reasonable choices for astronomy. I recently purchased some 70mm and 60 mm binoculars and am looking forward to comparing what I can pick up with each aperture. When conditions are really good I have been able to just spot M51, the Whirlpool galaxy just below the handle of the Plough, but have noticed that I found it a lot easier in the 70mm, even with not perfect conditions. I have also read that M1, the Crab Nebula in Taurus can be seen in binoculars. As this is a 9th magnitude object I will reserve judgement until I have tried it. The aforementioned only touches upon the vast array that can be seen with binoculars and I suggest those who are interested in an evening of binocular observation let me know and we can select a suitable night.

Debby Quertier

Illustrations prepared using © Sky Map Pro

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

Finding Martian Landers. New high-resolution imaging techniques are being used successfully to locate landers on the Martian surface, including the failed Polar Lander mission in 1999. It is hoped that the unsuccessful Beagle 2 craft may also be located. (Sky and Telescope, July 2005)

Putting Einstein to the Test. Einstein's general theory of relativity has not yet been tested to the highest precision. Laser ranging measurements of the Earth - Moon distance may reveal variations in gravity, and checks also began in 2004 using the Gravity Probe B satellite. (Sky and Telescope, July 2005)

Brave New Universe. Until now it has been accepted that there is an even, homogenous distribution of galaxies in the universe. Evidence is emerging that there is much more structure to the universe than is presently believed. (Astronomy Now, July 2005)

Jewels in the Sky. Patrick Moore's top ten selection of deep-sky objects, - nebulae, star clusters and galaxies, and how his Caldwell Catalogue was compiled. (Sky at Night, July 2005)

Mysterious Microworlds. There are more than 140 moons in our solar

system. Visits by spacecraft to regions of the outer planets have allowed many of these very different moons to be studied closely for the first time. A separate article ('An Ice Moon Revealed') describes the finding that apart from Titan, Saturn's moon Enceladus also has an atmosphere and evidence of geological activity. (Astronomy, July 2005)

Dark Threat. There are regular intervals between mass extinctions on Earth. Could these be caused by the solar system's motion through the galactic plane, or perhaps by disturbances produced if the Sun has a dark, smaller companion in a long period orbit? (Astronomy, July 2005)

Sungrazing Comets. Many comets pass very close to the Sun, some breaking up as a result. The solar satellite SORO has proved very useful in studying hundreds of these comets. (Sky and Telescope, August 2005)

Ten Big Mysteries of the Solar System. A selection of solar system mysteries, including the possible existence of one or more giant volcanoes on Mercury, why Saturn's moon Iapetus has a very prominent ridge around much of its equator, and the as yet unexplained mechanism that causes solar flares and eruptions. (Astronomy Now, August 2005)

Mars Reconnaissance Orbiter. Details of this space mission to Mars, which is due to arrive in March 2006 equipped with a large telescope and camera assembly for high resolution photography. (Astronomy Now, August 2005)

Seeing the Dawn of Time. How problems with the big bang theory were resolved by inflation theory - the very rapid expansion of the universe at the instant of its beginning. (Astronomy, August 2005)

Postcards from Mars. The exploration rovers Spirit and Opportunity have found Mars to be much more complex than previously believed. New detailed photos of the surface, including the first meteorite to be discovered on another planet. (Astronomy, August 2005)

Deep Impact Mission. The spectacular effect of the Deep Impact mission space probe with comet Tempel 1 on July 4th, to study the composition of a comet's nucleus for the first time. (Astronomy and Space, September 2005)

Hubble's 15th Anniversary. To celebrate fifteen years of the Hubble Space Telescope in orbit, new images of the Eagle Nebula and Whirlpool Galaxy are published. (Sky and Telescope, September 2005.)

Mars viewing Opportunity - 2005. Towards the end of October and early in November, Mars will be at its best for observation. It will not appear quite as large as it did in August 2003, but will be better placed, being about 30 degrees higher as it crosses the southern part of the sky. (Sky and

Telescope, September 2005)

A Record-Setting Solar Flare. On January 20th, particles from a major solar flare reached Earth in minutes rather than the usual hour or more, conflicting with accepted theory and putting the future safety of space exploration in some doubt. (Sky and Telescope, September 2005)

What happens when Galaxies Collide? In the last few years astronomers have begun to identify galaxies in collision, previously thought to have been just unusually shaped single galaxies. The study of processes involved in these events. (Astronomy, September 2005)

How the Universe has Surprised Us. There is quite a list of surprises in the history of astronomy, with such discoveries as supernova explosions, rapidly spinning 'pulsars', and the recent finding that the expansion of the universe is speeding up, driven by a mysterious 'dark energy', and not slowing down as was confidently expected: What other surprises may be awaiting discovery? (Astronomy, September 2005)

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