WEA Course

The Astronomy Section is running a 6-week "Star Gazing" course at the Observatory from the end of January for the Workers Education Association.

Lt Governor to visit

As part of their visits to La Société Guernesiaise, the Lieutenant Governor and Lady Foley will be visiting the Observatory on Friday the 18th January 2002 at 7pm. It is intended that they will stay for about an hour. We should be able to show them the Moon, Jupiter and Saturn and a selection of deep sky objects, weather permitting. If the weather is really awful we shall postpone the visit until the following Monday, 21st January. We hope to have a good turnout that night and members are invited to come along and meet Sir John and Lady Foley.

La Hougette School visit

Members willing to assist with this visit on Tuesday, 22nd January 2002 (rain date 19th February), with a 6.30 pm scheduled, start please let either Secretary know.

Messier Marathon

Members interested in taking part in the Messier Marathon on 16th March should contact Debby Quertier.

Crossword solution

The solution to the crossword will appear in the next edition or, if you can't wait that long, please contact the Editor.

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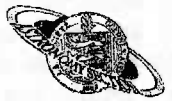
Sagittarius

The Newsletter of the Astronomy Section of La Société Guernesiase



January – March 2002

Forthcoming events

Annual Business Meeting
Tuesday 29th January
8pm at the Observatory

Messier Marathon
Saturday 16th March
at the Observatory
(see inside for details)

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

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Double Stars

Section News
by Debby Quertier

The Guernsey Press printed an article in October about what could currently be seen in the sky. We had provided details for them and they produced an interesting article as result. There is quite an interest in astronomy locally and general we get good feedback from people who have read the Press articles and listened to spots we do on Radio Guernsey.

Jessica Harris and I were both on together on Radio Guernsey's 'Favourite Things' programme on 15th November. Naturally astronomy featured very high on the list and was discussed at length but we both agreed that Harry Potter was also a favourite thing. Jessica has read all the books whereas I am a relative newcomer but have become totally addicted. I wouldn't mind the job of astronomy teacher at Hogwarts!

Our Open Evening went ahead as planned on Tuesday, 20th November. The date was chosen because there was a youngish moon, Jupiter and Saturn were now rising early enough for our younger visitors, and with the clocks having gone back it gave us a chance to start the evening a little earlier. Although there was a cloudy start and nothing much was seen of the Moon the event was well attended, with an estimated 80 to 100 people turning up. We were able to show them good views of Jupiter and Saturn in the telescopes as well as encouraging them to look at M31, M13 and other interesting binocular objects. We had spoken earlier in the day on Radio Guernsey to plug our event and made light of the many things we had planned to in the past and had been thwarted by the weather. This time we were lucky and the Open Evening was successful.

The 'halo' around the Moon on the 1st December caused quite a stir and our members and Radio Guernsey received several phone calls about it. Also that same Saturday night many people saw a very bright 'shooting star' just after ten-thirty pm. Although none of us saw it, it seemed very likely from the descriptions that it was a piece of space junk re-entering the atmosphere and burning up. There had been a page on Teletext that bright meteors had been seen that same night over the south of England and upon speaking to people and making several enquiries we discovered that a Russian rocket had been launched about 6pm our time (the purpose of which was to put some satellites into orbit) and the 'shooting stars' were part of the discarded rocket parts breaking up on entering the atmosphere. Some of the descriptions from the UK sightings described different colours seen and all descriptions said how bright they were and how 'long' they lasted, some said about 10 seconds. Space junk 'shooting stars' are not that uncommon but this piece had been especially bright and had provided quite a talking point and

was the subject of Radio Guernsey's phone-in the following Monday. I was unable to listen to the phone-in as I was at work, but they rang me during it and I was able to explain what had caused the halo around the moon and that I thought the explanation for the bright shooting star was space junk.

Forthcoming visits

On Tuesday, 22nd January 2002 a group of 50 children from La Houguette School will be visiting us. The visit is scheduled to start at 6.30pm and members willing to assist with this visit please let either Secretary know. If that Tuesday ends up with pouring rain then we shall put the visit off until Tuesday, 19th February. There is not a problem entertaining the 50 children, we can split them into three groups and using a smaller telescope as well as the 11" and 16", we can show them the Moon, Jupiter and Saturn. The problem would be if it was pouring, the building is not very large and it would not be possible to accommodate everyone. Let's hope it is clear as I do recall the last time La Houguette visited us the skies were cloudy.

Messier Time again

In April 2000 several of us attempted a Messier Marathon. Okay, we cheated by using the computer-controlled telescope, but as it had just got up and running it was a useful viewing exercise. We were doing well, with getting on for 80 objects seen, but we had to abandon it at about 4.30am as the clouds came over. We did plan another go last year but the weather was against us. So in 2002 will it be third time lucky? The date has to be chosen carefully, there is only a brief window of about three weeks when it is possible to do the marathon and it is advisable to pick a time when there is no Moon. In 2000 we had had to postpone from the 1st April to the 8th due to heavy rainfall, with the result that the young Moon, although setting early on, did make seeing some of the fainter objects difficult. This year, trying to work round the Moon I suggest we try the marathon on Saturday, 16th March 2002. This date is at the earlier end of the window and the best Saturday. If we put it off until April, it would need to be the 13th and possibly a bit too late to try. Anyone who is interested in giving it a go is welcome to come along. You need not stay the whole night (it is literally an exercise that takes from twilight until dawn) just come along and see what there is. By seeing so many objects in one go you'll be amazed just how different the many galaxies are, from spiral to irregular, face and side on and those with very bright centres. Those who are willing (or mad enough!) please let me know.

Debby Quertier

Astronomical Events in 2002

David Le Conte picks out the events to look out for this year

Planets

Jupiter will visible in the evenings from January to June, and again in November and December.

Saturn will be well-placed for evening observation from January to May, and from September to December. It is at opposition on 17th December.

We can expect many events involving Jupiter's moons, and Saturn's rings will remain a beautiful sight.

Mars can be seen in the evenings from January to June, low in the west.

Venus will appear as the evening star from February to August. Its greatest eastern (evening) elongation is on 22nd August. It will be at its greatest brilliance on 26th September and again on 7th December.

Mercury will be visible in the evening in the second and third week of January (maximum elongation on the 12th), late April and early May (maximum elongation on the 4th May), and in the last half of December (maximum elongation on the 6th). It will be close to the Pleiades on 30th April.

Uranus is at opposition on 20th August, Neptune on 2nd August, and Pluto on 7th June.

Occultations

Jupiter will be occulted by the **Moon** from 2:57 am to 3:40 am on 23 February. It will be close to the Moon at 5:50 pm on 26th January.

There is a grazing occultation of **Saturn** at 10:15 pm on 16 April, and there is another grazing occultation of this planet at 7:42 am on 14th May (but in daylight). The **Moon** passes close to **Saturn** at 1:30 am on 21st February.

At 2:03 am on 5th March the **Moon** will occult the 2.5 magnitude star **Graffias** in the constellation Scorpius. It will reappear at 3:09 am.

At 4:11 pm on 12th October the 2nd magnitude star **Nunki** in the constellation Sagittarius will be occulted, reappearing at 5:05 pm.

The **Moon** passes close to the open cluster M 35 at 8:45 pm on 22nd February.

Conjunctions

Venus, **Mars** and **Saturn** are close to each other on the 7th May. And three days later, on 10th May, **Venus** and **Mars** approach within one-third of a degree.

Meteors

The 4-day old Moon should favour observations of the **Perseid** meteors on the night of 12/13 August this year. The peak is predicted for the early morning of the 13th.

However, the **Leonids**, about the 17th November, will be hampered by the almost full Moon. The **Geminids** (14th December) will also be affected by the Moon.

Comets and asteroids

Several faint comets and asteroids should be visible, as in most years. Comet **Linear** 2000 WM1 should reappear in the northern hemisphere in April and May.

Eclipses

No eclipses are visible from Guernsey this year, apart from a penumbral lunar eclipse On 24th June at 10:20 pm, just after moonrise. On the 11th June there is an annular solar eclipse (visible from the Pacific). And a total solar eclipse on 4th December will be visible from Africa and Australia.

The Moon

***Frank Dowding** selects highlights from his recent talk to the Section*

In 1984 William Hartman and Donald Davis hosted an international meeting of scientists and astronomers at Kona Hawaii to discuss the Moon and how it was created. There they put forward a new theory that when the Earth was still developing and around two thirds of its present size it was hit by another developing planet, this one a little larger than the present size of Mars. The impact was colossal. One side of the Earth was exposed down to the core and the other planet destroyed. The heat of the impact sent a super-heated magma of rocks from both planets into space which formed a cloud around the Earth at a distance of 20,000 miles. About half of the magma cloud fell back to the Earth and eventually cooled normally. The other half of the magma cloud coalesced to form the Moon. Over time the Moon's orbital distance increased (a laser using a reflector plate left by the Apollo astronauts shows that it is still increasing by 4 cm a year).

The advantage of this theory over previous ones is that it explains why the Moon is less dense than the Earth even though it is made of the same materials. This is because as the Moon coalesced and cooled it did so under its own gravity, less than that of Earth, so that the bonding was not as tight. Although Hartman and Davis's explanation of how the Moon came to be is still a theory it has widespread support following the Hawaii meeting.

The Moon was formed in the age of large impacts, and the particularly large impactors caused the basins we now call the mares or seas. About a hundred million years later, when a crust had formed, radio-genetic heating took place inside the Moon which melted rocks so that heated magma again oozed towards the

surface. It could not get through the crust but did fill the basins and on cooling this is how we see the Moon today.

Around 400,000 million years later, in 1600, William Guilbert drew a sketch of the Moon that can now be seen in the British Library. His sketch was drawn without the aid of a telescope. The first man to draw a detailed map of the Moon with the help of a telescope was Thomas Harriot, a prominent mathematician, in 1609. His map was not discovered until after his death. Later in the same year Galileo used his telescope to produce a very fine water-colour painting as part of his book about the Moon named "Starry Messenger". It was an instant success and changed for ever the way men looked upon the Moon.

Maps started to appear with names of areas on them. The names did not gain general approval as they were of influential people and therefore controversial. Then a Jesuit priest called Giavanni Riccioli produced a map where the seas were named after effects and influences, and the craters after astronomers, Arabic thinkers, philosophers, Holy Saints, and other non-controversial people. This received approval from Jean Dominique Cassini, the first director of the Paris Observatory. Maps continued to improve using photography and, later, space probes. So it was that Neil Armstrong stepped on to Mare Tranquillitatis, an area named by a Jesuit priest 400 years earlier.

With the rocks brought back by the Apollo astronauts and recent space probes Clementine in 1994 and Prospector in 1998/9 many things are still being discovered about the Moon. It has a small core either of iron about 120 miles in diameter, or of a mixture of iron and nickel iron with a 500 mile diameter. Mare Inbium has more potassium and phosphorus around its edge than anywhere else on the Moon. There is uranium in the south polar region. There are gravity anomalies, just as on the Earth. The basin areas have a slightly higher gravity, which tends to support the theory of in-filling by volcanic rock. Most Moon rocks studied indicate they have been through a melting and cooling process.

By studying Moon dust it appears that there was a second age of bombardment around 400 million years ago. Both Clementine and Prospector detected hydrogen in large quantities in the polar areas, particularly in the south. This indicated to the NASA team that, as hydrogen would not exist on its own, there was water ice in areas which are permanently cold, inside craters that never see the Sun. However this view was not shared by everyone. On July 31st 1999 NASA diverted Prospector to crash into the area where the ice was expected to be. Although earth-based spectrometers and the Hubble telescope watched for any sign of any effect, nothing was seen. So speculation still surrounds this topic.

Traces of a magnetic field have been found in the form of localized magnetospheres.

There is a huge impact crater in the south just out of sight from Earth. It measures 200 miles across and 12 miles deep. Seismometers left on the Moon during the Apollo years indicate that around 3000 moonquakes occur every year, but never above 2 on the Richter scale.

More is still being discovered from analysis of data from the very successful Prospector probe. Prospector's main function was to map the Moon in fine detail, something which William Guilbert started four hundred and one years ago.

Frank Dowding

Astronomy and Space - References for Further Reading *by Geoff Falla*

Comets. Spacecraft sent to rendezvous and study comets in close-up seems to be the only way of unravelling their mysteries. Comets may be the least understood and perhaps are some of the most important objects in the solar system. *Astronomy, September 2001*

Palomar observatory. The 200 inch telescope at Mount Palomar was the largest in the world for almost 50 years. An account of its history, and life at the observatory, now equipped with adaptive optics. *Astronomy, September 2001*

Dark Energy. Recent evidence has confirmed that the expansion of the universe is accelerating, driven by an unknown energy. Theorists may need to reconsider the origin and evolution of the Universe. *Frontiers, Autumn 2001*

Jupiter in Close-up. A summary of what has been discovered from the recent Cassini spacecraft flyby and photography of Jupiter. *Astronomy Now, october 2001*

Monster Asteroid. Ceres is no longer the largest of the minor planets. Another, larger object has been found in the Kuiper Belt, beyond the orbit of Neptune. *Astronomy Now, October 2001*

Black Hole at the Centre of our galaxy. Evidence appears to confirm a black hole at the centre of our galaxy, but surprises include evidence of new star formation, and behaviour apparently different from those at the centre of other galaxies. *Astronomy, October 2001*

Callisto Surprises. The Galileo spacecraft has sent back very detailed images, revealing the most cratered moon in the solar system, also a surface with unusual ice spire features. *Astronomy and Space, October 2001*

The Race to Measure the Cosmos. The history of how the distance of the stars was first measured by the parallax angle from different points in the Earth's orbit, and the astronomers who were involved in the work, over several centuries. *Sky and Telescope, November 2001*

Comet Encounter. The spacecraft Deep Space 1 passed within 1400 miles of comet Borrelly in September, and obtained the best ever views of a comet's core. *Astronomy and Space, November 2001*

Satellite Triplets. The story behind the NOSS satellites - the Naval Ocean Surveillance System. The groups of three satellites travelling in a triangular formation are a U.S. spy satellite system for accurately locating and targeting naval ships. *Astronomy and Space, November 2001*

Mars - the Race to the Red Planet. A set of articles, including: The case for human exploration of Mars rather than the use of robotic missions, the problems involved, the work and ambitions of the Mars Society, and the most suitable sites for landing and exploration. *Astronomy Now, November 2001*

Rhythms of the Sun. Some of the history of sunspot observations, and how the existence of the sunspot cycle was first established by the amateur astronomer Samuel Schwabe in 1843. *Astronomy Now, November 2001*

The Milky Way. A mosaic of 51 wide angle photo images reveals the most detailed view yet of our entire Milky Way galaxy as viewed from Earth. *Astronomy, November 2001*

Near-Infrared Sky Survey. An ambitious survey of the entire sky, producing highly detailed images has been completed, and will be useful in further research. *Astronomy, November 2001*

Olbers' Paradox. Why is the night sky dark - when there are so many stars in the Universe? This question was posed by the astronomer Heinrich Olbers in 1823. The answer was not at all obvious, and was not resolved until the 20th century when it was found to concern the limitations of the Universe itself. *Sky and Telescope, December 2001*

Maksutov Telescopes. The life of the Russian optician Dmitri Maksutov, who developed a new optical design for a compact, high definition telescope sixty years ago, and is today one of the most popular types. *Sky and Telescope, December 2001*

America's new Mars Strategy. The history of Mars research to date, and the new strategy for the future. *Astronomy, December 2001*

The Earth from Space. Photographs of the Earth from space, as never seen before. The IKONOS satellite captures images with a one metre resolution, from a height of 400 miles. *Astronomy, December 2001*

Prospero - Memory of a U.K. satellite programme. The U.K. satellite Prospero launched 30 years ago can still be seen in orbit. A sad reminder of what could have been a successful space programme -before it was abandoned by a short sighted British Government. *Astronomy Now, December 2001*

Observing Double Stars

by Geoff Falla

We all have favourite objects to see in the night sky. For some of us it is the Moon, because it is so close and is the only object which can be studied in great detail. Some prefer to look at the planets, because there are ever-changing opportunities to view them, with at least one being usually visible in the night sky. Others prefer the challenge offered in finding galaxies in deep space, even though the view may not always be satisfying. Sometimes these objects are just too far away to be seen well using a moderate telescope, or perhaps if less than ideal conditions affect the view on a particular night. One of the pleasures of astronomy is that we can choose what is best to observe, depending on viewing conditions and the time of year. While light pollution, even from a partly moonlit sky, can affect our view of distant galaxies there are other interesting objects to be seen much closer to home - within our own galaxy.

The observation of double stars, some of them colourful and contrasting binaries with some multiple systems, is a good alternative on any night, or if viewing conditions are not ideal for other objects. The definition of double stars is also not affected too much by any unwanted light, with many of the best double stars being visible even with a small telescope. It is also a challenge in itself to be able to split the stars into their separate components, and in the case of very close doubles it is a good test for conditions and telescope optics.

The first serious work in observing double stars was by the famous British astronomer William Herschel, who began studying them in 1779. It had been thought up to that time that the apparent double stars were just two stars in a line of sight coincidence, with one star actually being much more distant than the other. While some of these star pairs have been proved to be optical doubles, Herschel was able to announce in 1802 that most of the doubles are true binaries, orbiting around each other and a common centre of gravity. It is now known that in our galaxy most of the stars around us are binary stars, and that our Sun is unusual in not having a companion star. Many eclipsing binaries are also found.

Most of the constellations have double stars which can be found quite easily with a moderate telescope. The constellation Ursa Major, with its very recognizable shape of the Plough, is always visible in the northern sky. On a clear night we can see with the naked eye that the second bright star in the 'handle' of the plough has a fainter companion very close by. Mizar, with its companion star Alcor, is where the first telescopic double star was discovered. It was while observing the pair of stars in 1650 that the Italian

astronomer Giovanni Riccioli discovered that Mizar was itself also a double star. The Mizar double can be seen easily with a moderate telescope, but the system of three visible stars has turned out to be more complex. In 1889 the American astronomer Antonia Maury made the first discovery here of a spectroscopic binary, a star that is in orbit so close to its primary that it can not be seen, even with a powerful telescope. Light analysis using a spectroscope, and observing the Doppler effect as the stars move around each other in their orbits, is the only way in which these very close binaries can be revealed. Both Mizar and its secondary, visible binary were found to have spectroscopic companions. The orbital periods of stars in binary or multiple systems can vary greatly, up to a period of thousands or even millions of years. It has been found that in the case of Mizar, the companion star visible with a telescope has an orbit of about 20,000 years, while the spectroscopic one is so close that it has an orbital period of just twenty days.

One of the best known constellations, and certainly the favourite of the winter skies, is Orion - the Hunter, with bright stars outlining its shape clearly. Below the easily recognized Hunter's Belt of three stars is the Sword, with its bright nebula of star-forming gas. It is here that the Trapezium can be found, a close multiple system of four newly formed stars. At the western, upper end of the Belt, is the star named Mintaka with a wide, easily separated companion, while at the other end of the belt the star Alnitak is a more challenging double. Just below Alnitak there is another attractive multiple, Sigma Orionis.

Perhaps the best, and one of the most colourful of the double stars is Albireo, in the constellation Cygnus. High in the summer evening sky, and visible in spring through until autumn, Albireo is at the lower end of what is often referred to as the Northern Cross, or at the head of the Swan. Not far away is a much more difficult object in the small constellation Lyra, marked by the brilliant star Vega. Close by, just to the east of Vega, binoculars will show that star Epsilon is a close pair of stars, but a telescope with a high power eyepiece will reveal that each of these stars is a very close double, with one pair set at right angles to the other. On the opposite side of Cygnus is another small constellation, Delphinus - the Dolphin. Here the star gamma is another colourful double, easily seen in a telescope as there is better separation of the two components.

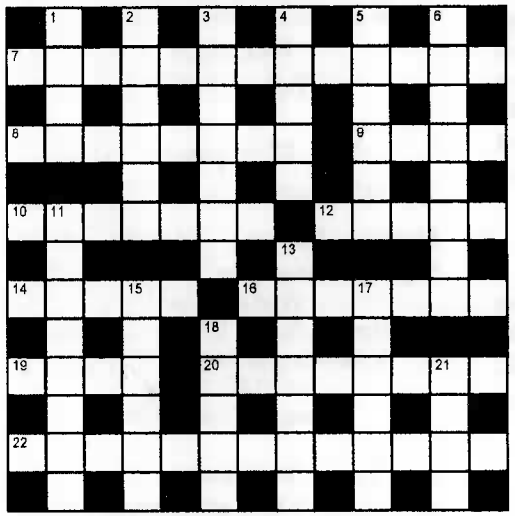
In the autumn sky, the constellations Andromeda and Pegasus become prominent. In Andromeda, the second bright star in the line of stars leading northwards from the Square of Pegasus is another double star with good colour contrast. The star is named Almaak and is also considered to be one of the best double stars to be seen.

When looking at double stars, it is sometimes asked how far away the stars are separated from each other. It has been found that in the case of close double stars the distance is comparable to that of the outer planets from the Sun, while a spectroscopic binary would be as close as one of the inner planets.

The study of double stars has been important in the history of astronomy. The spectrum of light from a single star, or the reflected light from a planet, will reveal the composition of its atmosphere, but as with our planetary system a lot more can be learned from the study of orbits and gravitational effects. It is from the study of double stars that astronomers have been able to discover more about the mass, size, and evolution of the stars.

Geoff Falla

ASTRONOMY CROSSWORD



Across

7. Apparent force on a planet's surface caused by its rotation (8,5)
8. Steadily progressing time, such as GMT (4,4)
9. A group of asteroids that cross the Earth's orbit (4)
10. The brightest star in Scorpius (7)
12. Telescope support (5)
14. The fly constellation in the southern hemisphere (5)
16. Plural of spectrum (7)
19. The constellation Leo (4)
20. The period just after sunset and before sunrise (8)
22. Where American space probes are launched (4,9)

Down

1. His law relates to distances of the planets from the Sun (4)
2. A satellite of Uranus (6)
3. The double star Beta Cygni (7)
4. Faint light on the unlit part of Venus (5)
5. Southern hemisphere constellation containing the Large Magellanic Cloud (6)
6. The star Alpha Eridani (8)
11. This Almanac contains astronomical and navigation data (8)
13. Telescopes are such instruments (7)
15. The crab constellation (6)
17. The constellation Caelum (6)
18. The second closest moon of Saturn (5)
21. The main part of a comet (and of an astronomer!) (4)