Thanks to the Ozanne family

A notice has been framed and placed on permanent display in the Observatory to acknowledge the generous gift of accessories for the new telescope made by the Ozanne family in memory of the late Percy Ozanne.

Messier Marathon

The Messier Marathon scheduled for the 1st April 2000 was abandoned due the most awful weather - it couldn't have been worse. Heavy rain and cloudy skies made it impossible on the best possible Messier night of the year when there was no moon. We have decided to try again on the 8th April but whether we shall have better luck is anyone's guess. However many objects we manage to see it will be a useful viewing exercise and will get us used to the new telescopes.

Debby Quertier

Stop Press

The postponed Messier Marathon went ahead as planned on 8th April and was very successful. About 88 or 89 Messier objects were observed before cloud and mist made further observing impossible at about 4 am.

Astronomy Section Officers

Joint Secretary	Jessica Harris	47193
Joint Secretary	Debby Quertier	725760
Hon Treasurer	Peter Langford	720649
Editor	Peter Langford	720649
Facilities	Geoff Falla	724101
Public Relations	David Le Conte	64847
Imaging	Daniel Cave	64415
Research	Frank Dowding	55215
Librarian	Debby Quertier	725760

Observatory:
Rue du Lorier, St Peters,
Guernsey Tel: 64252

Web page:
www.netcomuk.co.uk/~pmlang

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

3 Cameron Place, Upper St Jacques,
St Peter Port, Guernsey GY1 1SU
Tel: 01481 720649
Fax: 01481 715702
E-mail: pmlang@netcomuk.co.uk

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

Sagittarius

The Newsletter of the Astronomy Section of La Société Guernesiaise

April - June 2000

Forthcoming events

"In the Beginning"
Talk by David Williams
Tuesday, 23rd May
8 pm at the Observatory

Solar Observing
Sunday, 18th June
1.30 pm onwards
at the Observatory

Observatory Clear-up Day
Saturday, 16th July
9 am onwards
at the Observatory

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

In this issue

Titan
The Spring Sky
Bright Stars

Inside

Centre inserts

Star chart
Moon phases
Sunset and sunrise times

New Telescopes Unveiled

The unveiling of the new telescopes was scheduled for the 10th March 2000 and, once all the food and wine was ordered, the guests and the media invited, the only thing that could go wrong was the weather - what would we do if it rained!! Fortunately for us the weather was dry, but cloudy. Despite this our 100 or more guests seemed to be enjoying themselves. In the run up to the 10th we had been interviewed by David Earl of Radio Guernsey and got some publicity for the new telescopes and the Guernsey Press had written a piece on it with a photo of David Le Conte and Frank Dowding. CTV, Island FM, the Press and Radio Guernsey all turned up on the 10th, together with John Burley, the chairman of Le Riche Group, who would unveil the telescopes. Jessica and I spoke to CTV before the unveiling and the crew then stayed around and filmed everything. Jessica and I made speeches in which we spoke of telescopes in general and how we raised the money for the new ones. The telescopes were covered by the Guernsey flag which John Burley then unveiled. Everyone present was invited to take a look through the telescopes. The moon was now briefly appearing during gaps in the clouds. Everyone seemed very pleased with what they saw. The whole evening was a great success and all who attended seemed to enjoy themselves.

The press took photos of the telescopes, with John Burley, Nick Ozanne and Alan Bisson, trustees of the Centenary Fund, plus Jessica and myself. There was a nice write up a few days later about all that had happened. We spoke on Radio Guernsey on the morning of the 11th March. CTV ran a piece about us on the 14th March which we were very pleased with.

The observatory was open to members of La Société on the 11th March and the general public on the 14th. Both events were well attended with about 50-60 people on the 11th and around 100 plus on the 14th. Both nights had clear skies and we were able to show what the new telescopes could do.

Thank you to everyone who has been involved with the fund raising, work on the telescopes and the open evenings. There has been a lot of hard work involved and a great deal of time given. It has been well worth it as we now have these magnificent telescopes.

All in all the 10th March was the culmination of many months of hard work and fund raising. We have received wonderful coverage in the media and everyone involved has enjoyed being involved. I have sent Anne Binney at Le Riche a report and photo of the telescopes.

Thank you to everyone who has been involved with the fund raising, work on the telescopes and the open evenings. There has been a lot of hard work involved and a great deal of time given. It has been well worth it as we now have these magnificent telescopes.

Debby Quertier

Minutes of the AGM held at the Observatory on the 19th January 2000

Those present: David Le Conte, Roger Chandler, Frank Dowding, Geoff Falla, Debby Quertier, Jessica Harris, Peter Langford and Lawrence Guilbert

All officers were reelected, though the position of Light Pollution Officer remains vacant. Anyone wishing to take on this post please let the Secretaries know. The Editor expressed a wish for more contributions to Sagittarius so please have a go at writing.

The Treasurer presented his report and the finances of the Section are very healthy. The accounts are available to La Société if so required. The donation of £1000 from La Société was discussed and it was agreed that in view of our healthy finances that we no longer needed this money. A suitable letter is being sent to La Société.

We then discussed our future requirements and the need to budget for the future. A computer for the telescope building was discussed and the revamping of the Observatory building. It was decided that we would get the C14 properly mounted, though this would be done once the work on the Meade was completed. As regards any alterations to the building we would obtain a copy of the lease and check the clauses for what alterations we could make.

We agreed to set up sub committees to do -

1. Suggestions as to possible improvements or alterations to the building.
2. Maintenance work to the C14.
3. Looking into sorting out the building now.

We discussed maybe acquiring a draftsman's chair.

The New Telescopes

The Meade works fine though there has not been time yet to get it properly aligned due to poor skies. The equatorial mounting needs good alignment, it is a heavy job to do and again needs clear skies to get the two star alignment. We are close to exceeding the weight limit on the Meade and will need to get counter weights to balance the Takahashi. This will cost about £350, which was agreed and the order will be placed.

We discussed how everyone could learn to use the new telescopes properly.

The Launch date for the Meade/Takahashi was agreed as the 10th March with the 11th and 14th as open evenings. Debby Quertier and Jessica Harris would arrange the Launch party and budget for it.

The Viewing program was agreed.

The Solar Mirrors

We have the Coelostat screen, hood and electrics and intend to set them up permanently at the Observatory, possibly on the roof with a weather proof cover. Roger, Gareth and Lawrence will look into this.

Fundraising
We agreed that it would be a good idea to have some article for sale and maybe do the Harbour Carnival again and possibly the shows.

Membership was discussed and we now have joint and family memberships as well as individual ones. Appropriate letters will go out to members.

There was no other business and the meeting closed at 11pm.

Debby Quertier

Visits to the Observatory

We were pleased to welcome Jim Williams and the St Martins Men's Church Group to the Observatory on the 26th January 2000. The weather was good and they enjoyed clear skies and views of Jupiter and Saturn.

On the 15th February we welcomed a group of year 5 pupils from La Houguette school. Unfortunately the skies were cloudy until, just as the children were leaving, they cleared. Most of the children were glad to actually discover which one Jupiter was, despite not seeing it in a telescope. We showed them the new telescope and they were certainly impressed. One of them stated that they would like one like that for their birthday! Despite not getting a look through a telescope their enthusiasm and knowledge impressed us and we were pleased to receive several thank you letters from them a few days later.

On Friday the 17th March the Boys Brigade, with whom we'd done earlier work, came to the Observatory but again the skies were cloudy. They were shown the new telescope and how it worked and various computer programs, though these could not match seeing the real thing.

Debby Quertier

Satellites in Formation

Further to the item 'Satellites in Unison' in Sagittarius, October - December 1999, p7, three satellites recently seen travelling in a triangular formation, an answer seems to have been found.

Reading an article on the subject of satellites in Astronomy Now, February 2000, Paul Gavey came across a reference to the groups of three satellites called Naval Oceanic Surveillance Satellites (NOSS). The satellites monitor radio transmissions from foreign ships, and by flying in close formation they can triangulate and fix positions very accurately. The group of three can just fit into the field of view of 7 x 50 binoculars, and although usually around magnitude 6 in brightness they can sometimes shine briefly at easy naked-eye magnitude.

The three satellites certainly fit the description. They were in close formation, and disappeared in turn into the earth's shadow as they travelled in a southeasterly direction.

Geoff Falla

Titan
by Frank Dowding

Titan is Saturn's largest moon, but quite different to our own. It is larger than our Moon and, like the Earth, it is big enough to retain an atmosphere. The fact that Titan's atmosphere is so dense, much more than ours, is due to its extremely cold temperature, minus 180°C. At this temperature gas molecules travel slower, so cannot achieve the required escape velocity.

The satellite is is made of ice and rock but the ice has never become water, it has always been too cold.

A space traveller standing on the surface, preferably in a boat, would be in quite a dark environment. It is estimated that the scene would be as at midnight on Earth with a full moon.

It is thought that the nitrogen that makes up most of the atmosphere was once trapped inside the ice particles and became released when the temperature rose to around minus 140°C, probably during the bombardment era or due to tidal flexing from Saturn.

Within the nitrogen, approximately 300 - 500 km from the surface, is a layer of hydrocarbon particles of methane origin. These particles react with the nitrogen to form hydrogen cyanide. Hydrogen cyanide has never been detected before outside our world. It is a necessary ingredient to support life along with amino and nucleic acids. As the particles react they become larger and form dense clouds. The larger particles within the clouds then start to fall, like rain. On reaching the surface the particles stay there but the methane gas rises again to further react with other particles.

This has left the ice surface of Titan covered with a 'gooey' mixture of methane hydrocarbons and ethane. The ethane is a consequence of the methane rising. Now ethane on Titan is at just the right temperature and pressure to exist as a gas, liquid or solid. As very little will float on ethane Titan has most of its surface covered by an ethane sea, with some ethane land masses and a sea bed of hydrocarbons, which fell as rain.

A space traveller standing on the surface, preferably in a boat, would be in quite a dark environment. It is estimated that the scene would be as at midnight on Earth with a full moon. The Sun could not be seen due to the dense atmosphere, but horizontally vision would be better. It would be unimaginably cold.

Scientists believe that Titan is a copy of the Earth before life began and to go and see Titan would be like going back in time on Earth. Titan is too cold to sustain life as we know it, but if it could be moved closer to the Sun who knows what would happen?

Frank Dowding

The Sky in Spring
by Lawrence Guilbert

By the time that these notes appear in print winter will have gone and Spring will be with us. Our opportunities for viewing will diminish as daylight encroaches into the night and no longer will we see a brilliant star-studded sky. However, although the Spring skies will be less brilliant there will be much with which to get acquainted.

Orion will have sunk very low in the west, but the bright stars of Gemini, i.e. Castor and Pollux, together with Capella and Procyon, will still be with us. The Great Bear, commonly called the Plough, will be very evident in an almost overhead position and Cassiopeia will be found somewhere low in the north.

Looking south we should see the constellation of Leo spread across the sky and away to the east the most brilliant Arcturus will dominate the view. Incidentally this splendid star will be viewable from Spring throughout Summer to Autumn.

Cancer is a rather faint constellation, representing a giant sea-crab, although its two brightest stars are only at the fourth magnitude it is not hard to find as it lies between the twins, Castor and Pollux, and Leo the lion. In Cancer is the Praesepe, sometimes called the Beehive or M44. It is interesting because, whilst the naked eye sees only a hazy patch, binoculars or a small telescope will show a cluster of many stars.

On the eastern side is Corona Borealis, a small but conspicuous constellation that really does resemble the object it is named after. Corvus, Leo Minor and Virgo are constellations that can also be found.

An interesting thing to do is to watch the movement of the planets. On 1st April Mars will be slightly above a line drawn through Jupiter from Saturn and protruded, about half the distance between them, beyond. During the next fortnight Mars will proceed northeast and make the apex of a triangle with the line Saturn to Jupiter as the base.

Lawrence Guilbert

Astronomy and Space - References for further reading
compiled by Geoff Falla

The Planet Venus. Our nearest neighbour in the Solar System. Discovery of its total difference to Earth, and radar imaging of its surface features. *Astronomy and Space, December/January 2000.*

In the Shadow of the Moon. The last total solar eclipse of the 20th century. A selection of photographs taken by amateur astronomers. *Astronomy and Space, December/January 2000.*

The Sun. A series of special articles about the Sun, including its evolution, the solar wind and its effect on Earth, and the underground search for solar neutrinos. *Astronomy, January 2000.*

Images of the Century. The ten most inspiring images of the century. Historic photographs of deep space scenes and space exploration, selected by voters on Sky and Telescope's web site. *Sky and Telescope, January 2000.*

Cosmic Discoveries of the Century. Milestones in astronomical discoveries during the 20th century. *Sky and Telescope, January 2000.*

Missing Mars Probes. Details of the failure of the Mars Polar Lander mission on December 3rd, 1999, with no communications received from the main craft or its two independent probes after a perfect flight. *Astronomy Now, January 2000.*

Life in Deep Caves. The study of life in deep cave systems, and how it will help in future missions to search for the existence of life on Mars. *Astronomy Now, January 2000.*

Astronomy - Past, Present and Future. A summary of some of the greatest achievements in astronomy during the last millennium, prospects for astronomy and space research in the next thousand years, and how the pattern of the constellations changes over the course of time. *Astronomy Now, January 2000.*

Extrasolar Planet Observation. Details of the first direct observation of an extrasolar planet, seen in transit across a star in the constellation Pegasus. *Astronomy, February 2000.*

The Habitable Zone. The concept of a habitable zone around stars, and the need to reappraise the idea in the light of recent discoveries such as the tidal heating in the case of Jupiter's inner moons. *Astronomy Now, February 2000.*

More Extrasolar Planets. From the first discovery in 1995. A survey of the techniques used to find 28 extrasolar planets up the end of 1999, and prospects for further discoveries and more detailed observations. *Astronomy Now, February 2000.*

Solar Eclipses - on Mars. Phobos, the larger and closer-orbiting of the two Martian moons, produces eclipses daily. Photograph of an eclipse shadow, the eclipses being annular rather than total. *Astronomy Now, February 2000.*

Satellite Observation. Types of satellite in low Earth orbit. The observation and identification of the many satellites which can be seen. *Astronomy Now, February 2000.*

The Star Eta Carinae. One of the brightest stars, Eta Carinae, is a variable with an unpredictable and mysterious behaviour. *Astronomy, February 2000.*

Lunar Prospector. A summary of the lunar mission which ended in July, 1999, having found signs of ice at the Moon's poles and evidence that the Moon has an iron core. *Astronomy, February 2000.*

Time. The importance of time. The time light takes to reach us from distant galaxies can reveal some of the past history of the Universe. Unlike light speed, time is not constant but is variable. *Astronomy, February 2000.*

Europa - Surface Features. Remarkable lines and scalloped markings on the icy surface of Europa, a puzzle for scientists to discover how they were formed. *The Planetary Report, January/February 2000.*

Solar Storms. The various forms of solar activity and outbursts, which can have dramatic effects on communications, satellites and power systems. The development of 'space weather' monitoring and forecasts. *Astronomy Now, March 2000.*

Auroras - Fire in the Sky. The origin of auroras - the Northern and Southern lights, with many stunning examples photographed. *Sky and Telescope, March 2000.*

Messier Marathon. Observing all 109 objects in Charles Messier's catalogue of deep sky objects in a single night. *Sky and Telescope, March 2000.*

Geoff Falla

Bright Stars
by Peter Langford

The bright stars are often used as markers to help find one's way around the night sky but they are also interesting in their own right. This article takes a look at the fifteen brightest stars (excluding the Sun) visible from our latitude.

The first question to ask about the bright stars is are they bright because they are very luminous or are they bright because they just happen to be close? Our Sun of course is a good example of the latter. It is less luminous than any of the fifteen bright stars but appears very bright because it is extremely close.

Before answering the question it will help to know something about the magnitude system which astronomers use to compare brightness. The magnitude scale was defined by Hipparchus and refined by Ptolemy some 2000 years ago. In this scheme the naked eye stars fell into six categories. The brightest stars were first magnitude and the faintest were sixth magnitude. (The bigger the magnitude the fainter the star). The human eye perceives light in an interesting way. Imagine you have three light bulbs, one of 40 watts, one of 100 watts and one of 250 watts. You line them up side by side and then stand at such a distance that the 250 watt bulb is as bright as a first magnitude star. The 100 watt bulb would be about as bright as a second magnitude star and the 40 watt bulb a third magnitude star. Note that to increase brightness by one magnitude the energy output has to increase by two and a half times.

William Herschel and others quantified the magnitude scale so that the five magnitudes difference between a first magnitude star and a sixth magnitude star corresponds to 100 times more energy output. Thus if the 250 watt bulb was our first magnitude star a sixth magnitude star would 2.5 watts. (The ratio of 100 times for five orders of magnitude means in fact that the ratio for one order of magnitude is slightly more than 2.5 since the fifth root of 100 is about 2.512).

five magnitudes difference corresponds to 100 times more energy output.

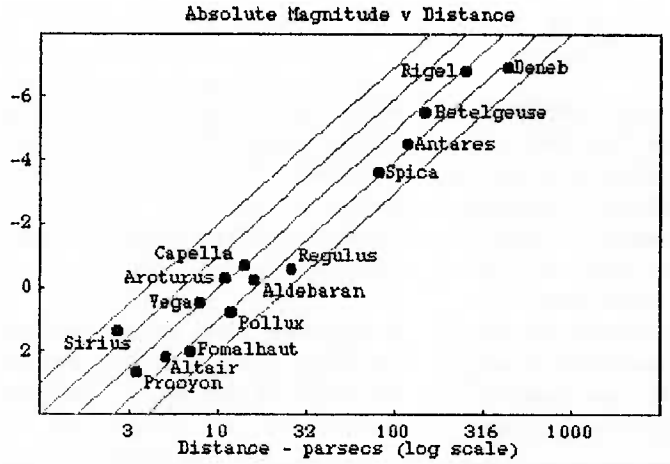
As a diversion you can use the basics of the magnitude system to calculate what magnitude stars you could observe with a telescope. Say the pupil of your eye is a quarter of an inch. If you have a 16 inch telescope it would have 64 (16 x 4) times the diameter and hence 4,096 (64 x 64) times the area for collecting light energy. This corresponds to slightly more than 9 magnitudes (2.5 to the power 9 is 3,815) so that theoretically the 16 inch telescope could add 9 magnitudes to your naked-eye limit of 6, making 15 in all.

The other important thing we neeed to know about magnitudes is how apparent magnitude changes with distance. That way if we know a star's distance we can work out what its magnitude would be at a standard distance so we can then compare different stars. Going back to our light bulbs a simple experiment would show that if you put the 250 watt bulb 2.5 times further away than the 100 watt bulb they would both appear equally bright. In other words increasing the distance by 2.5 times increases the magnitude by one. (Again the ratio is more precisely 100 times corresponds to 5 magnitudes or more like 2.512 for one magnitude). This makes sense because the amount of light energy received by one's eye is directly proportional to the distance away of the source of energy.

Astronomers have various methods for estimating distances to stars, well outside the scope of this article. Knowing the distance one can convert from a star's apparent magnitude (how bright it looks from here) to an absolute magnitude (how bright it would look if it was a standard distance away). The standard distance astronomers have chosen is 10 parsecs (3.26 light years). At that distance our Sun's magnitude would be an unimpressive +4.8.

The first chart on the following page shows the absolute magnitudes of the bright stars versus their distance from us. Distances are on a log scale so that distances are multiplied as you move along the horizontal axis. The diagonal lines show the lines of constant apparent magnitude. Stars along any particular line would all appear to be as bright as each other.

The fifteen stars seem to fall into two groups, with ten of them being relatively close and five being much further away. The "close" group, in order of distance comprises Sirius, Procyon, Altair, Fomalhaut, Vega, Arcturus, Pollux, Capella, Aldebaran and Regulus. Sirius, the brightest star in the night sky, is also the closest at just 2.7 parsecs (about 9 light years) away. Regulus, the furthest

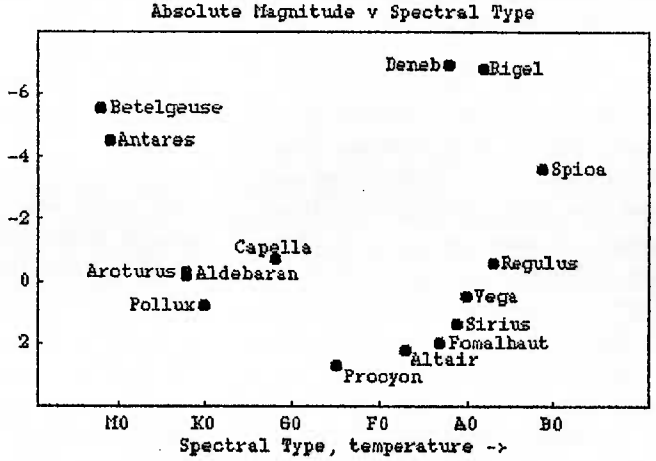


Rigel's is minus 6.8, giving over 11 magnitudes difference between those stars and our Sun. Recall that 10 magnitudes corresponds to a 100 x 100 = 10,000 times difference in light energy output, so 11 magnitudes is 2.5 times that, or 25,000 times in all. You can appreciate that these stars are on a massively different scale to our Sun.

in the group, is 26 parsecs (about 85 light years) away. Capella and Regulus are the brightest (in absolute terms) of the stars in this group, with absolute magnitudes of -0.7 and -0.6. This means there is more than 5 magnitudes difference between these stars and our Sun so they are emitting over 100 times the light energy of the Sun.

The "distant" group comprises Spica, Antares, Beltelgeuse, Rigel and Deneb. Distances for these stars ranges from 80 parsecs (260 light years) for Spica to 430 parsecs (1,400 light years) for Deneb. (Distances as great as these are difficult to measure and estimates vary). The distant group is also correspondingly brighter. Deneb's absolute magnitude is minus 6.9 and

The second chart below keeps the same vertical axis as the first chart, absolute magnitude, but shows spectral type along the horizontal axis. Spectral type corresponds to the colour of the star, and also its temperature. The resulting graph is called a Hertzsprung-Russell diagram, except that I have taken the liberty of reversing the horizontal axis on my chart so that star temperatures increase, rather



than decrease, from left to right. On the Hertzsprung-Russell diagram the fifteen bright stars fall into four main groupings.

The first group comprises the "main sequence" stars, Procyon, Altair, Fomalhaut, Sirius, Vega, Regulus and Spica. Stars on the main sequence, like our Sun, are in the longest stage of their life cycle, converting hydrogen to helium in their cores. What determines the position of a main sequence star on the Hertzsprung-Russell diagram is its mass. The more massive the star the hotter and brighter it is. Spica, at the top end of the main sequence is actually a double star, one with 11 times the mass of the Sun the other 4 times the solar mass. Procyon, at the bottom end of the six stars on the main sequence, has a mass of 1.7 times that of our Sun. It is a white star, hotter than the Sun but much less hot than Spica, which is classified as hot blue.

The more massive the star the hotter and brighter it is.

The group of four "close" stars that are not main sequence stars are Arcturus, Aldebaran, Pollux and Capella. These are all giant stars. They are not particularly massive but have reached the end of their hydrogen-burning life and have swelled up enormously. The reason they are bright therefore is that they are large. Take Arcturus as an example. It has a similar mass to the Sun but it has a diameter 27 times that of the Sun. Although its temperature is only about two-thirds that of the Sun's, its greater diameter means it is over 5 magnitudes brighter so it gives out over 100 times the light energy. When the Sun reaches the end of its main sequence life it too may end up looking like Arcturus.

Four or five magnitudes brighter than the giant stars, but somewhat cooler, are the two red supergiants, Antares and Betelgeuse. Supergiants are very massive stars. Betelgeuse for instance is 15-20 times more massive than the Sun. Its diameter is so great that it could easily contain the orbit of the Earth around the Sun. Its atmosphere is very tenuous and the star's magnitude varies. One day it may explode in a supernova.

The final two stars on the list, Deneb and Rigel are also supergiants, but they are hot blue or blue white stars. Massive stars run through their life very quickly. Rigel for instance, which is more than 25 times more massive than the Sun, cannot go on shining for more than another ten million years at most. (Compare this to about 5,000 million years for the Sun). Supergiants are actually very rare but because they are very bright they stand out.

Much more could be said about each of the fifteen bright stars. However, it is hoped that by seeing how they fall into different groups you can start to obtain an insight into their very different characters.

Peter Langford

Sources and further reading:
"Introductory Astronomy and Astrophysics" by Zeilick & Gregory,
"Brilliant Stars" by Patrick Moore