Globular Clusters

Globular clusters, concentrations of from several tens of thousands to maybe a million stars, are popular objects for observing through the telescope. Frank Dowding has been finding out about them and will be giving a talk on 15th April at the observatory. All members are welcome.

Transit of Mercury

A transit of Mercury, when the planet passes between the Sun and the Earth so that its disc crosses the face of the Sun, is fairly rare. There are only about 13 per century. The first transit since 1999 takes place on 7 May, and will last from 6.11am to 11.29am. Mercury is probably too small to see the transit through eclipse viewers but an attempt will be made to observe it using the solar mirrors and telescope (with a solar filter) at the observatory. Observing the Mercury transit will provide good practice for the much rarer transit of Venus due in 2004. **Remember never to look at the Sun without a proper optical filter.**

Extraterrestrial Intelligence?

For many years Geoff Falla has taken an interest in UFO research and other unexplained phenomena. On 20th May he will give a talk at the observatory examining some of the evidence. Does it point to extraterrestrial intelligence? Members are invited to contribute their own unusual sightings and partake in the discussion about this controversial topic.

Astronomy Section Officers

Joint Secretaries	Jessica Harris	247193
	Debby Quertier	725760
Hon Treasurer	Peter Langford	263066
Editor	Peter Langford	263066
Facilities	Geoff Falla	724101
Public Relations	David Le Conte	264847
Imaging	Daniel Cave	
Research	Frank Dowding	255215

Observatory

Rue du Lorier, St Peters,
Guernsey
Tel: 264252

Web page

www.astronomy.org.gg

Material for, and enquiries about Sagittarius should be sent to the Editor
Peter Langford
La Hougue, Rue de la Hougue Bachelle
St Saviours, Guernsey GY7 9QE
Tel: 01481 263066
pmlang@netcomuk.co.uk

Copy deadline for next publication is 15th June 2003

La Société Guernesiaise, Candie Gardens, St Peter Port, Guernsey GY1 1UG. Tel: 725093

Sagittarius

The Newsletter of the Astronomy Section of La Société Guernesiase

April - June 2003

Forthcoming Events

Globular Clusters
talk by Frank Dowding
Tuesday 15th April
8pm at the Observatory

Transit of Mercury
Wednesday 7th May
6.11am to 11.29am at the Observatory

Extraterrestrial Intelligence?
talk by Geoff Falla
Tuesday 20th May
8pm at the Observatory

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

Inside

Section News	2
Annual Business Meeting	2
The Habitable Zone	4
Astronomy references	8
Observatory Open Days	10
Programme for 2003	11

Centre inserts

Star chart
Sunset, sunrise, moonset and moonrise times

Section News

*by **Debby Quertier***

Our Annual Business Meeting was held on the 4th February 2003 and the minutes are included in the magazine.

The first part of the year has been dominated by the WEA course. It again proved to be very enjoyable for both the 'pupils' and the 'teachers'. We covered a wide variety of topics and were able to take full advantage of clear skies and good viewing opportunities. Feedback forms have been returned by the attendees to the WEA and we have no reason to believe that they will be anything other than favourable. With the experience gained from running the course last year we have been able to make a few changes and additions which we hope improved the course this year.

Our first open evening of the year was on the 11th March and, due to the rotten weather, no one turned up. We had a group of Beavers, aged 5 and 6 years old, visit the Observatory one Wednesday evening. The weather was again awful but they were entertained by Jessica and David. For cloudy evenings we have slide shows and the Starry Night computer programme which provides a lot of entertainment.

The magazine includes the dates of Open Days for the coming year. Anyone who is able to come along and assist will be very welcome. When the sky is clear we do tend to get a lot of people turning up, with the July/August open nights being very well attended by holidaymakers.

Annual Business Meeting

*The Section's Annual Business Meeting was held at the Observatory on Tuesday 4th February 2003. **Debby Quertier** took the minutes.*

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

1. Election of Officers
All Officers were duly re-elected with exception of the Librarians, Cathy and Julie. Debby Quertier agreed to catalogue the library. Jessica and Debby will also arrange to box up the journals and send them to the Royal Astronomical Society. It was also agreed to look at sharing the Editor's workload.

2. Treasurer's Report
The Treasurer presented his report for the year ended 31st December 2002. The Section did fairly well from the donations during the summer. It was agreed to buy a few more items to sell for fund-raising, but with more emphasis on the educational side of things. It was agreed to use La Société's photocopier for the magazine to save money on printing and Geoff Falla volunteered to do the copying. It was discussed whether we could get a more advantageous rate on our funds by using another bank account.

3. CCD Camera
The CCD camera which is on order from True Technology will cost approximately £2,500. The order was placed before Christmas with a likely delivery date in March. It was agreed that we need a new eyepiece for the Meade and to budget for one at a cost of about £200 to £300. The precise specification still needs to be decided.

4. National Astronomy Week
National Astronomy Week will be in August 2003, coinciding with when Mars will be at its closest to Earth. It was agreed that we would hold some open evenings and put up some Mars-related displays at the Observatory. Material would be obtained from the National Astronomy Week. We would also link in to their website. We will look to put together ideas and have the displays from July onwards.

Regarding the transit of Mercury it was agreed that we should put in some practice with the solar mirrors to view it from the Observatory. It was not expected that there would be a great deal of publicity for this transit, but if there was then we should stress the safety aspect (never to look at the sun directly or through a telescope or binoculars without proper filters). We should expect more publicity for the transit of Venus next year as it will be the first in living memory. The message here was 'be prepared'.

For National Science Week 2004, our usual attempt at a Messier Marathon will coincide with this.

Glynn Allen is setting up a schools science club and we may be involved in some work with them.

5. Visitors and Groups
The Open Days (evenings when the Observatory is open to the public) had worked well last year. It was agreed that, as before, we would hold Open Days monthly for most of the year and weekly in the school summer holidays. A Salle Publique licence was considered, which would allow the Section to charge an admission fee. However, we would have to apply for Building Control and obtain Royal Court approval. Although it could be a positive move for the future it was decided to stay with requesting £1 donation from visitors for this year.

6. Workers Education Association
The WEA course went very well last year and, with the benefit of experience from that course, the 2003 course is also going well. The course requires a lot of resources however, and it was agreed not to run it more than once a year. For 2004 we may consider slightly later dates.

7. Viewing Programme
The viewing programme (published in this edition of Sagittarius) was

discussed. We also discussed the need to spend some time familiarising ourselves with the CCD camera when we get it so that we will be ready to use it when Mars is at its best.

It was agreed that we enjoyed the talks and that Geoff Falla would do a talk in May and Frank Dowding would do one in April – the dates are in the viewing programme.

As La Société Guernesiaise is promoting family membership it was agreed that we would put on a family event for Société members, some time later in the year, after the clocks have gone back.

8. Any Other Business
David Le Conte noted that we should ensure that the outside lights were on when visitors arrived.

The doors to the observatory building were now beyond repair. One of the options was to block up the unused half of the doorway and fit a standard door. It was agreed to look at the options and then make a decision.

There was no further business and the meeting closed at 9.30pm

Debby Quertier

The Habitable Zone

***Geoff Falla** looks at the regions where life could evolve*

It was in 1995 that the first definite evidence was found of a planet in orbit around another star. Not that the planet could be seen by any of the present telescopes - even using the Hubble space telescope. The star and its planet were much too far away for that, but the presence of the planet was given away by its gravitational tug on the parent star, pulling it very slightly out of position. The star, in the constellation Pegasus, is many light years away, and the planet was estimated to be at least half the size of Jupiter.

The continuing search for planets around other stars has been successful. Already by the end of the year 2002 the total had exceeded the hundred mark, including some stars which seem to have more than one planet in orbit. It is accepted that, because of the distance, it is not yet possible to detect the presence of smaller planets which must surely also exist. It seems that other solar systems, with a range of planets varying in size and distance from their central star, as in our own solar system, must be much more common than was previously thought.

The apparent planet-forming process has already been observed. In the Orion nebula, a gas cloud containing more recently formed stars, it has been found that many of these stars have clear evidence of discs of material in the process of planetary formation. It is now thought that the formation of planets in this way is a natural by-product of star formation.

What are the chances of life on any such planets? For any kind of planetary life to develop, it is generally accepted that the presence of water is essential. If a planet is too far away from its parent star, the environment will be much too cold, only allowing water to exist in the form of permanent ice. If the planet's orbit is too close, the amount of heat generated will not allow any water to be retained, evaporating away to leave totally dry conditions. For these reasons the ideal region around any particular star, where water may continue to exist long enough for life to evolve, has been termed 'the habitable zone'.

As we have been sending out our own radio waves for well over half a century, any other civilisations within that range would already know of our existence

These possibilities, from the development of some kind of life, and leading up to the chances of there being intelligent life elsewhere, form the basis of the 'Drake Equation'. This was developed by scientist Frank Drake - the first person to use a radio telescope in the search for other civilisations in space. Project Ozma was started in 1960 at the National Radio Astronomy Observatory at Greenbank, West Virginia, and developed into the SETI Institute - the search for extraterrestrial intelligence. The equation, formulated with the assistance of leading scientific colleagues, used the considered possibilities from the formation rate of stars to the likely chances of finding stars with planets, then planets with the necessary conditions for life to evolve - leading to the development of intelligent life. This indicated the degree of probability that other civilisations would exist elsewhere in space, and that communications from a sufficiently advanced technology could be detected by a radio telescope. As we have been sending out our own radio waves for well over half a century, any other civilisations within that range would already know of our existence.

All of the considered factors in the equation were not claimed to be a scientific formula, just a conclusion arrived at after careful scientific consideration. The resulting best estimate was that there could be at least a thousand, and perhaps far more, advanced civilisations in our Milky Way galaxy alone.

Each star would have a habitable zone around it, depending on the potential heat radiated in relation to planetary orbits. In our own solar system, the habitable zone is accepted as

extending from the orbit of Venus out to the orbit of Mars. Mercury is much too hot, and has virtually no atmosphere, while beyond Mars the major outer planets - Jupiter and beyond - are much colder with atmospheres largely consisting of hydrogen and helium. Earth's position and environment are just right, with a reasonable climate for living conditions over most of its surface.

Venus, as we now know, has a 'runaway greenhouse effect' atmosphere. Although there is evidence that Venus once had a much more favourable environment, the surface conditions are now extreme. The surface has a temperature of around 500 degrees Centigrade, so that no water could exist on its surface, and the atmospheric pressure is almost a hundred times that at the Earth's surface. The first space probe to attempt a landing, the Soviet Union's Venera 3 in 1966, was unsuccessful as it was crushed by the immense pressure before it was able to reach the surface. It was only after the probes were modified and strengthened considerably that successful measurements and the first photograph of the surface were obtained.

There is also evidence that Mars once had a much more Earth-like environment, which may have allowed life to develop there. Signs of extensive flows of water seem evident in the past on Mars. Water still exists locked up as ice in the polar caps, and it is thought that there may still be water below the surface. Mars has a polar axis tilt almost identical to that of Earth, producing the same seasonal changes, and it is also thought possible that much longer period cyclic changes, which could melt one of the polar icecaps, could produce a complete change in its atmosphere and climate. Life on Mars may have already developed during its earlier history, remaining more dormant during inhospitable periods.

There is also evidence that Mars once had a much more Earth-like environment, which may have allowed life to develop there

Apart from the position of planets in relation to the Sun, or another star, other factors must also be considered as playing a part in whether conditions may be favourable for the development of life. Bearing in mind that Venus has a very dense atmosphere which has produced overheating of the planet, we need to consider how atmospheric conditions may improve the chances on a planet or moon which happens to be well outside the limits of the habitable zone. In the case of Saturn's largest moon Titan, for example, space probe measurements of its atmosphere have found it to be rather more dense than Earth's at sea level, while the main ingredient of Titan's atmosphere is nitrogen with organic compounds. It is thought that all the essentials for life actually exist, but planetary scientists estimate that the surface temperature would still be too low to have allowed any kind of life to develop there.

It has also been discovered that gravity may play a vital part in the development of suitable conditions. When the first Voyager spacecraft obtained close range images of Jupiter's innermost moon Io in 1979, a number of active volcanoes were observed on its surface. What should have been a cold, inactive moon was surprisingly found to be generating a considerable amount of heat. The answer was soon obvious - it was the powerful gravity of Jupiter producing tidal forces, and heating within Io. Later it became evident that similar tidal heating could also be affecting Europa, Jupiter's second moon. Although the very cold conditions had produced an icy surface as expected, the ice was cracked with evidence of movement - like ice floes. It was suggested that water beneath the ice would be warmed by the same tidal energy from Jupiter, and that it was very possible that life could exist there.

As can be seen, there are several factors which can modify the concept of the habitable zone. The position of planets in relation to the Sun, or to a star in another solar system, is not the only deciding factor considered to be relevant.

Our own solar system's position within the galaxy seems also to be important. There is a galactic zone which is considered to be more favourable. In the outer regions of the Milky Way, there is found to be a lower rate of star formation, and any planets there would be smaller. They would cool quickly, and the lower gravity would not enable them to retain an atmosphere.

In our own part of the Milky Way, evidence now suggests that planets of all sizes may be common, with many Sun-like stars

Towards the central core of the galaxy the environment would be much more dangerous, including high levels of radiation. Some of this would be associated with the black hole which is now known to exist at the very centre of the galaxy.

In our own part of the Milky Way, evidence now suggests that planets of all sizes may be common, with many Sun-like stars. Continuing research into conditions that exist on the solar system's other planets and moons indicates that water is present in abundance, as it seems to be in comets and in more distant space.

As the chances of finding other life-bearing planets are further refined, and with the conditions considered suitable being expanded in the light of continuing discoveries, it seems increasingly likely that we may be far from alone in the Universe.

Geoff Falla

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

Mirror Matter. Physicists are now considering radical new theories to explain evidence of invisible matter in the Universe. Particle physicists suggest that a peculiarity of neutrinos indicates the presence of mirror particles. *Astronomy Now, January 2003*

Comet Landing Project. A set of articles on the subject of comet interceptors. The space probe Giotto achieved a flyby of Halley's comet in 1986. Now there is a project to send a European space probe named Rosetta to orbit comet Wirtanen, and to put a lander on its surface. *Astronomy Now, January 2003*
The Rosetta project was postponed following the failure of an Ariane rocket launch in December. *Astronomy and Space, March 2003*

The Origin of Meteorites. Meteorites are thought to be fragments of asteroids. Researchers studying chondrites - the most common type of meteorite, have found new ways to trace their origin. *Astronomy Now, January 2003*

The Dark Ages in Astronomy - from Ptolemy to the Renaissance. Knowledge of astronomy and the naming of the constellations was developed by Ptolemy at the beginning of the first millennium, and recorded in the ancient library at Alexandria. Much of that knowledge was lost, and was only maintained in part by the use of calendars to mark important religious dates. Knowledge was later revived during the Renaissance, and by the development of printing. *Sky and Telescope, January 2003*

Saturn's Rings - a Colour Mystery. Observations of Saturn have revealed a mystery in the colour variations reported in its ring system. The reality of the observations has been confirmed, but the explanation has not yet been decided. *Sky and Telescope January 2003*

Leonids, 2002. An expected spectacular display of the Leonid meteors on November 11th was largely spoilt by cloudy conditions across much of Europe, but some good images were obtained. *Astronomy and Space, January 2003*

New Planet Explorers, and the Search for E.T. These are two of the major features included in a special edition of Astronomy Now magazine. Plans for planetary landing robots, and an interview with Seth Shostak of the SETI Institute - using a radio telescope to listen for signals from other civilisations in space. *Astronomy Now Special Issue - 2003 Yearbook*

The Cosmos from Other Worlds. How would the view look if we were on another planet beyond our solar system? Many stars - binary or multiple systems, are very different in brightness compared to our own Sun, and the view would change completely. *Astronomy, January 2003*

Mars Research Station - on Earth. Not too far into the future, there may be a manned flight to Mars. In preparation for this, and to simulate the conditions as near as possible, a Mars Research Station has been set up in the Utah desert. *Astronomy, January 2003*

Double Stars for small telescopes. More than half of the stars in our Milky Way galaxy are binary doubles. Details of some of the most interesting ones to be observed, many with contrasting colours. *Astronomy, January 2003*

Cosmological Maps. A four year survey of galaxy redshifts, involving a quarter of a million galaxies, has produced maps revealing some of the structure of the Universe. An even larger survey is planned. *Sky and Telescope, February 2003*

Infrared Space Telescope. NASA is planning to launch a new space telescope in 2003 to study infrared sources, which is expected to lead to new discoveries. Apart from the Hubble Space Telescope for optical work, previous NASA space observatories have included gamma ray and X ray telescopes. *Sky and Telescope, February 2003*

Venus in Focus. A set of articles on what is presently known about Venus from spacecraft missions; also future projects, and the discovery that the present atmosphere and surface of the planet is very different to that of its past. *Astronomy Now, February 2003*

Totality in Australia. A review and photographs of the solar eclipse of December 4th, 2002 in the Southern Hemisphere, as seen from South Australia. *Astronomy Now, February 2003; Sky and Telescope, March 2003*

Shuttle Columbia Lost. On February 1st the Space Shuttle Columbia, with seven crew on board, disintegrated as it was returning from a 16 day orbital mission. A preliminary account of the tragedy, which is expected to have a severe effect on the NASA space programme. *Astronomy and Space March 2003*

Giant Ring of Stars around the Milky Way. A previously unknown giant ring of stars has been found surrounding our galaxy, extending well beyond the spiral arms. *Astronomy and Space, March 2003*

Ultrahigh-Energy Cosmic Rays. The most likely sources of most cosmic rays are supernovae in our Milky Way galaxy, but the more recent discovery of much higher energy cosmic rays will require a very different explanation. Several possibilities are being investigated. *Sky and Telescope, March 2003*

Ancient Astronomy. A set of articles on the astronomy of ancient times. Looking at the developments in observational astronomy by the Egyptian, Babylonian, and Greek civilisations. *Astronomy Now, March 2003*

Observatory Open Days 2003

Day	Date	Time	
Tuesday	11th March	8.30 pm	
Tuesday	8th April	9.00 pm	
Tuesday	6th May	9.30 pm	
Tuesday	3rd June	9.30 pm	
Tuesday	8th July	9.30 pm	
Tuesday	22nd July	9.30 pm	
Tuesday	29th July	9.30 pm	
Tuesday	5th August	9.00 pm	
Tuesday	12th August	9.00 pm	Mars after midnight
Tuesday	19th August	9.00 pm	Mars after midnight
Tuesday	26th August	9.00 pm	
Tuesday	2nd September	8.30 pm	
Tuesday	30th September	8.00pm	

The above times/dates are subject to the weather and there will be no viewing if the skies are cloudy.

Mars will be at its closest in August 2003, though it will be best viewed after midnight. Details of any special openings will be announced nearer the time. We also intend to have a display at the Observatory. Things will start being put together shortly and if any one has any ideas to contribute, they are most welcome to put their suggestions forward.

Programme for 2003

Day	Date	Event
Thursday	30th January to 6th March	WEA course
Saturday	26th March	Messier Marathon (weather permitting)
Tuesday	15th April	'Globular Clusters' - talk by Frank Dowding
Wednesday	7th May	Transit of Mercury
Tuesday	20th May	'Extraterrestrial Intelligence?' - talk by Geoff Falla
Monday	9th June	Pluto at opposition
Saturday	July	Observatory clean-up day - date to be announced
Monday	11th August	Perseids meteor shower and BBQ
Saturday – Saturday	23rd – 30th August	National Astronomy Week focussing on Mars
	September	Mars viewing
	October	Talk by David Le Conte - details to be announced
Monday/ Tuesday	17th/18th November	Leonids meteor shower
Saturday/ Sunday	13th/14th December	Geminids meteor shower
	December	Christmas meal - date and venue to be announced