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F.A.S. Newsletter

Circulated with this issue of *Sagittarius* is the latest issue of the Newsletter of the Federation of Astronomical Societies. Once again the Astronomy Section of La Société Guernesiaisie has a mention.

New members

Several people joined up as new members as a result of Patrick Moore's visit and the public Star Nights. Welcome to: Felicity Belfield, David Bellinger, Judy Bougourd, Jane Darlow, Simon and Thomas Bradshaw, David Nicolle, and Ken Staples.

One new member who signed up during Patrick Moore's visit was - Patrick Moore!

In the beginning . . .

In giving the 21st anniversary lecture on the 6th April, David Falla reminisced about the foundation of the Section on the 6th April 1972. He brought along several papers which documented the beginning of the Section, including his letter to the Press asking for anyone interested in forming an astronomy society to contact him (this resulted in six replies), his first lecture (based on a paper which he had written for the School Science Review), and the signatures of those who attended the first meeting (including Frank Dowding and Geoff Falla). Copies of these papers will be kept in the Section's archives.

Western star dial time?

In the western film *Red River*, shown recently on television, is the line: "See those stars up there? That's the Big Dipper. Cowboys tell the time by them." Perhaps we should advertise our Star Dial in the wild west!

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Education Officer: David Williams, 725088

The next newsletter will be published at the end of June. The deadline for publication materials is the 15th June.

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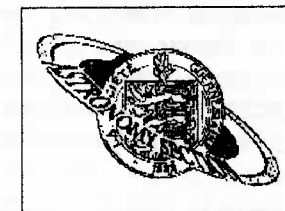
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Sagittarius

The Newsletter of the Astronomy
Section of La Société Guernesiaisie

May/June 1993



Forthcoming events

John Hodder's Garden
Sunday 25th April
2.00 - 5.00 pm

Amateur Satellites
by Neil Turner
Tuesday, 4th May

8.00 pm at the Observatory

Old Astronomy Texts
Led by Graham Green
Tuesday, 1st June

8.00 pm at the Observatory

U.F.O.s - Fact or Fiction?
by Antony Saunders
Tuesday, 29th June

8.00 pm at the Observatory

In this issue

Daniel Cave on active optics
David Williams on the months
David Le Conte visits Newton's home
Geoff Falla's star chart
Mark Humphrys on galaxies in Leo

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Welcome new Secretary

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At the Special General Meeting held on the 2nd March, Geoff Falla was elected the new Section Secretary, by popular acclamation. Geoff is a founder member of the Section, and we all welcome his appointment. He may be contacted at Highcliffe, Avenue Beauvais, Ville au Roi, St. Peter Port, telephone 724101 (call after 7 pm).

Geoff has prepared the month's star chart which is included as an insert in this newsletter.

... and Education Officer

At the same meeting David Williams was elected as Education Officer. David is at Beechwood, Queen's Road, St. Peter Port, telephone 725088.

DLC will continue to edit the newsletter.

Open garden on Sunday

Don't forget! John Hodder's garden is open this Sunday, the 25th April, from 2 pm to 5 pm in aid of the Astronomy Section. Entrance is £1.00, and teas will be available. It is at Le Courtillet de Bas, Mont Durand, St. Martin's (Perry's Guide page 31 E3). There will be signs from Les Camps crossroads and Jerbourg Road.

Help is needed to collect gate money, serve teas, guide parking, etc.. Cakes, scones, etc. would be welcome. A limited amount of parking is available at the Blue Horizon Hotel. However, it would help if members parked at Le Riches and walked via Le Vallon or Jerbourg Road.

Come and support this event!

Amateur satellites

The main May meeting will be on Tuesday the 4th, when Neil Turner will be talking about amateur satellites. Communication and broadcast satellites are normally only accessible to the professional. However, less well known is the large number of satellites built by and for "amateurs". Neil will describe the history of AMSAT, and outline the facilities available by amateur satellites.

Old astronomy texts

There are two main meetings in June. The first, on Tuesday, the 1st, is about old astronomy books. It will be led by Graham Green, who has a remarkable collection of ancient books and maps, including some with astronomical references. It will also give you an opportunity to bring along any old books, etc. which you might have, and which would be of interest. I will bring several of my books. *DLC*

U.F.O.s - fact or fiction?

The second June meeting will be held on the 29th, when Antony Saunders will be talking about unidentified flying objects. This is always a subject which causes discussion, and I am sure this evening will be no exception. Whatever your views come and share them.

The answer is 56

- but what is the question?
Find out on page 10.

A great day!

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... was had by all on the 10th March, when Patrick Moore visited Guernsey. In fact, the previous evening was also a memorable event. Patrick arrived later than expected (having had to do a voice-over for the BBC), and therefore had only a few minutes at the Observatory before we went to supper at the Fleur du Jardin. As it was cloudy that did not matter too much, and the supper gave a chance for everyone to meet him, and for Patrick to relax.

However, when we emerged from the hotel at about 11.00 p.m. the sky had cleared completely, although there was a full moon. Patrick suggested going back to the Observatory to observe Mars, and this we did - well half a dozen of us. Although the seeing was very poor, we observed Mars (Patrick making sketches), and also glimpsed the Moon and Jupiter, until 12.30 a.m..

The following day, the 10th, Patrick was ready bright and early for interviews with the Guernsey Evening Press and BBC Radio Guernsey. He gave a lunchtime talk at the St. Pierre Park Hotel at a fund-raising event for Beechwood School. Then we went up to the Observatory for an interview with Channel Television, then to Beau Sejour to load slides and check arrangements for the evening's talk, and straight to the Education Development Centre for 4.40 p.m. where Patrick and I spoke to about 30 primary school teachers attending an introductory course in Astronomy. At 5.40 p.m. we were back at the Observatory for the opening, and then to Beau Sejour for the evening lecture.

A full day, and an exciting one!

The opening

The opening was attended by a sizeable group of members and guests, including Sir Charles Frossard, President of La Société, and Lady Frossard, Griff Caldwell, Honorary Secretary of La Société, and Dr. Pilkington. After an introduction by David Le Conte, Patrick Moore opened the building with great panache. There was a ribbon cutting, followed by the presentation of a gift - a Guernsey - by Geoff Falla on behalf of Section members. The building's roof and walls were then opened, nine balloons (one for each planet) sailed up into the sky, and Patrick "unveiled" a plaque by bursting balloons with gusto. The Press did a good job of covering the event, featuring it on the front page of the next day's edition.

Thanks are due to all members (and spouses) who helped to make the opening such a successful event - providing food, serving food and drinks, making displays, etc. etc..

Looking for life

Patrick Moore's lecture at Beau Sejour was a tremendous success. It was sold out about two weeks in advance - a few people even managed to squeeze into the projection box! Many people took the opportunity of meeting Patrick after the lecture, and talking to Section members. A brisk business was experienced at the sales and information table (£115 was taken!), and the display created by Gareth Coleman and David Williams caused much interest. Again, lots of members contributed to the evening, for which many thanks. *DLC*



The Opening of the new Observatory building by Patrick Moore on the 10th March 1993

The 14-inch telescope

The 14-inch telescope is fully operational, and Dr. Pilkington has given some members training on its use. It is important that only members who have been trained attempt to use it, as incorrect operation could result in damage. The same applies even more so to the 8-inch Schmidt Camera.

It is particularly essential that care is taken when the roof is being rolled open and closed. The telescope must be set on the meridian and at a declination of about -40° (giving a clearance of a couple of inches), otherwise there is a real danger that it could be damaged by the roof. We are looking into possible safety devices, but in the meantime, take care!

The telescope is quite serviceable, especially for deep sky work, but loses collimation and does not give sharp »

stellar images or high resolution planetary images, presumably because of a loose gasket under the front plate. Dr. Pilkington will be sending it away for overhaul, so it will be unavailable for a few weeks. We are investigating installing the 11-inch on the pier while the 14-inch is away.

Anyone using the 14-inch and new building is invited to make suggestions on their operation and layout, so that improvements can be made.

We are most grateful to Dr. Pilkington for making his telescope available for the Section's use. I must make it clear that the instrument remains his property, but that he has kindly based it at the Observatory so that it can have a wide use. It is certainly a most valuable addition to our facilities. **DLC**

30 days hath September ... Why?

David Williams continues his series on the origins of units of time

The word *month* gives a clue as to the origin of this particular measure of time, as the word comes from *Moon*.

As far as we know, the earliest months were a measure of the lunar cycle, the length of time from New Moon to New Moon, approximately $29\frac{1}{2}$ days. This measure is known as the lunar month, and its use was to cause chaos later when accurate measurements of the year and calendar were made (see next issue of *Sagittarius*).

The names of the months are yet again traced to Roman/Greek origins, with the names being based upon gods or important people of the day.

January	-	Janus , the god of doors
February	-	Februus
March	-	Mars
April	-	Aperire , Latin, to open (Spring time)
May	-	Maia , goddess, originally Greek
June	-	Juno
July	-	Julius Caesar
August	-	Augustus Caesar
September	-	Seventh
October	-	Eighth
November	-	Ninth
December	-	Tenth

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The days in a month were originally calculated as 29 (a more detailed account will appear in the next issue), but this approved to be inaccurate, and so the Romans set about sorting things out. However, originally the Romans had used a 10-month year beginning in March. It was King Numa Pompilius in c.700 BC who added the two extra months January and February, but decided not to alter the existing ones. As a result, the 7th to 10th months became the 9th to 12th months which we use today.

David Williams

Next time David will be writing about the year and the calendar.

Particles from space

About fifteen members attended the 21st Anniversary Lecture by David Falla on the 6th April. David pointed out that astronomers mostly studied the radiation from the universe, across the electromagnetic spectrum, but cosmic rays and neutrinos are actual particles which can tell us a lot about the physics of stars.

Cosmic rays, charged particles, were discovered in 1912. David was himself involved in research on cosmic rays from balloons, and showed us pictures of the tracks left by the particles in photographic emulsions. One interesting fact is that cosmic rays are so energetic - they can have energies up to 100 million times the highest energies produced in big particle accelerators - that one particle could light up a 60 watt light bulb for a few seconds!

David also described the production of neutrinos in stars, including our Sun, and the difficulty in detecting these particles which can go right through the Earth.

A visit to . . .

Woolsthorpe Manor

Seeing no signs to Woolsthorpe Manor, I searched for someone to ask in this small, apparently deserted village. Eventually I found a small group of people heading towards the local hostelry for their Sunday lunch. My enquiry met with blank faces - Isaac Newton's House? However, someone had overheard, and pointed out that this was the wrong Woolsthorpe, although the only one on my map. Woolsthorpe Manor, where Newton was born on the 25th December 1642, and did his major work on gravity and light, is about ten miles south of Grantham, Lincolnshire, not five miles west.

So, after a hearty lunch myself, I found the Manor amongst farmhouses, in an attractive setting (it is signed from the A1). An imposing house from the outside, it is essentially a two-up two-down arrangement, however with large rooms. It is run by the National Trust, is furnished in the period of Newton, and includes his death mask. The walls of the main room, originally the kitchen, have interesting charcoal graffiti, at least one of which, a windmill, was drawn by Newton himself as a boy.

Upstairs is the bedchamber, where Newton is presumed to have been born. His birth is commemorated by a plaque with Pope's epitaph:

*Nature, and Nature's laws lay hid in night:
God said, Let Newton be! and all was light*

Also upstairs is the room which Newton used as a study when he returned home in 1665, following the closure of Cambridge University by the plague. During two fertile years here he discovered calculus, »

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experimented with his theory of colours, and developed his theory of gravity.

Of particular interest to me was a small partitioned room within the study which contains a reconstruction of Newton's famous experiment in which, around the 21st August 1665, he split the Sun's light into a spectrum using a prism. He used a slit in a window shutter, but the demonstration uses an artificial light source positioned in the tiny window. There is also a celestial globe and a facsimile of Newton's reflecting telescope.

Finally, of course, there is the orchard, containing the famous apple tree. In 1726 Newton told a colleague, Stukely, while they were sitting in a garden drinking tea under the shade of apple trees:

"He was just in the same situation, as when formerly, the notion of gravitation came into his mind. It was occasion'd by the fall of an apple, as he sat in contemplative mood. Why should that apple always descend perpendicularly to the ground, thought he to himself. Why should it not go sideways or upwards, but constantly to the earth's centre."

As his work on gravitation began at Woolsthorpe, the story of the falling apple has become associated with the orchard there. The ancient apple tree in front of the house is believed to have grown from the remains of the original tree, which blew down in 1820 (the house contains a chair made from its wood).

After spending a most pleasant and contemplative couple of hours in this peaceful place, I picked up a fallen apple, and, resisting the temptation to take a bite, went on my way.

David Le Conte

Active optics

Most of the large optical telescopes built in the past decade have remained in the 4 metre class. The reason for this lack of growth (other than the technical difficulty in building larger telescopes) has been the way in which the collecting surface was used.

With increasing detector efficiency over the 1980s, keeping pace with the astronomer's desire for light grasp, larger telescopes were not essential; why build a larger telescope next week when a new detector tomorrow will do the same thing? Now, however, with a CCD recording virtually every photon striking it, larger mirrors are required to prevent the science from stagnating. In the 1990s the next generation of high technology telescopes are being built.

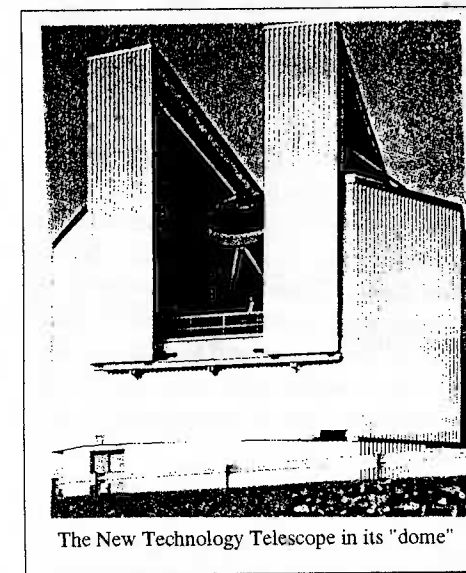
Large monolithic telescope mirrors have many technical problems associated with their construction and operation. These problems increase as the operational wavelength decreases. If the mirror is large, it also has to be thick in order to maintain its accurate surface. If the mirror is thick it has an enormous thermal inertia - meaning poor image quality due to convection currents until the glass is at the temperature of its surroundings. Immunity to expansion or contraction with temperature is also needed, something not present in normal glass. Also the telescope tube must be kept stubby to reduce the size and cost, and increase the stability of the building housing it.

For a telescope to perform well, these problems must be solved. One telescope that does so is ESO's (the European Southern Observatory) NTT (New Technology Telescope) situated at »

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La Silla, Chile.

The 3.58m aperture NTT is of the modified cassegrain design, the Ritchey-Cretien, and exploits many of the recent advances in telescope technology. It has a 0.88m convex secondary and a flat tertiary mirror which diverts the light through the centre of the attitude bearing to either one of two observing platforms, an arrangement known as Nasmyth focus. Unusually, the NTT has no cassegrain focus. It has a small dome (thanks to a short tube and an altazimuth mounting) and a thin, lightweight, f2.2 meniscus mirror with a short cooling time and excellent optical quality.



The New Technology Telescope in its "dome"

The mirror is made of a glass-ceramic material (Schott Zerodur) with a negligible coefficient of thermal expansion. It is formed by combining two glass types: one with a positive coefficient of thermal expansion, the other a negative. The glass remains dimensionally stable over a large temperature range. »

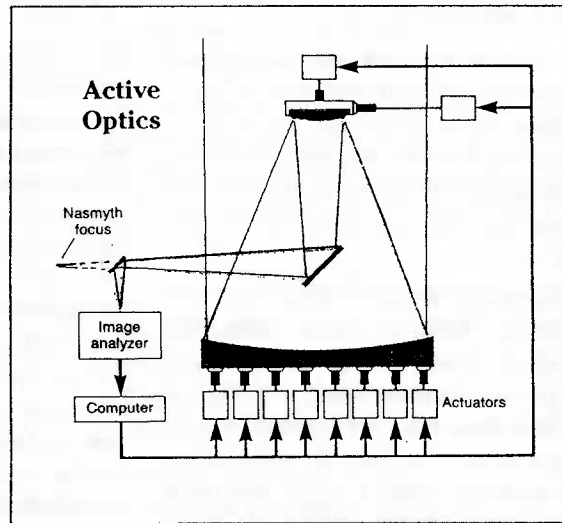
The grinding and figuring of the mirror took 18 months at the Carl Zeiss Optical Works using advanced computer polishing machines.

Conventional methods take around 4 years. This 0.24m thick disk would distort under its own weight and lose its optical figure very easily, were it not for active supports.

The active optics of the telescope means that it is always in prime condition. The mirror is held in an advanced cell containing 75 actuators which can independently push slightly on the back of the mirror to maintain an ideal shape. An image analyser looks at the figure of the primary mirror using a modified Hartmann test. It detects any aberrations that may be present due to flexure of the glass, and a computer calculates by how much each of the actuators has to be moved in order to correct them. There are also actuators on the secondary mirror to centre it with respect to the primary and to adjust its tilt. These two adjustments are needed to counteract any small movements in the telescope tube framework. The whole process takes about a minute, using the light from a 14th magnitude guide star on which to calculate the corrections.

The results are impressive. When imaging a point source (such as a star) the primary mirror concentrates 80% of the starlight into a 0.096 arc second circle. After two more reflections from the secondary and tertiary mirrors this grows to 0.125 arc seconds. By comparison, the older 5m Hale telescope concentrates 80% of the light into 0.7 arc seconds.

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The active optics system means that the telescope essentially maintains itself. Conventional collimation techniques are too laborious to keep a telescope in an optimum state all the time, and often are not carried out. With a thin mirror such as NTT's, normal methods simply would not work.

Another of the innovations used at this telescope is the dome in which it is housed. Using experience gained at the MMT (Multiple Mirror Telescope), designers improved the technology further. The whole shelter rotates with the telescope on a 7-metre azimuth bearing. Its form was carefully chosen after extensive wind tunnel testing. Conventional domes cause air turbulence which can degrade the seeing. Such "dome seeing" is greatly reduced around the NTT. The shape is rather box like, and differs from the more normal hemisphere. The dome is also air conditioned and cooled to the ambient night-time temperature to eliminate convection currents, which

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also degrade seeing. Even the mirror, floor, drive motors and electronics are cooled, which means that as soon as it gets dark, observations can begin. Large telescopes such as the Russian 6m can take many hours to cool, and, in the case of the 6m, can sometimes never cool down sufficiently that worthwhile observations can begin before dawn comes. (*The Kitt Peak 4m dome has a sign on entry warning of possible ice on the floor, as it is refrigerated!* - Ed.)

The NTT was designed with remote observing in mind. Remote observing means the astronomer does not have to travel all the way to La Silla, saving on travel costs. The link is achieved via satellite. The telescope can be instructed where to point and the cameras operated remotely from the other side of the world. The data can then be transmitted back to the observer thousands of miles away; one CCD image takes 10 minutes to transmit.

Good as the NTT is, it is really only the prototype for ESO's VLT (Very Large Telescope). This telescope will consist of four 8m mirrors, each employing active control, and contain improvements learnt from the NTT. Firstly, the actuators will be able to pull as well as push, unlike the NTT. It has been found that the NTT's active optics do not work quite so well when the telescope points too far from overhead; gravity is used to keep the mirror in contact with the actuators. Secondly, the diameter-to-thickness ratio of the mirrors will be 46:1, as opposed to 15:1 for NTT. This was because initially there were doubts as to whether active optics would work, so it was decided to make the NTT's mirror just thick enough to support itself should it fail. This will mean that the VLT's mirrors are only

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17.5-cm thick! The telescopes will operate in the open air, having collapsible domes covering them when not in use. The light gathering power of this telescope will be equivalent to that of a 16m reflector. However, if the four telescopes can be used as an interferometer, they will obtain the resolution of an aperture 150m across.

Active optics is one of several technologies being pursued to build 8 metre class telescopes. Other contenders include the segmented mirror approach used by the W.M. Keck telescope and the spin cast mirrors produced by the Steward Observatory Mirror Laboratory (University of Arizona). With enough funding and effort they will probably all work, and the deciding factors as to which is used most will be the effectiveness and cost. The next few years will be an exciting time in telescope technology, with many new telescopes coming into operation. Active optics has already proven itself in the 4-metre class telescopes, and, hopefully, it will soon in the 8-metre class.

Daniel Cave

Supernova observed

After some perseverance, Daniel Cave and David Le Conte succeeded in positively identifying the supernova in galaxy M81, which was discovered on the 28th March. We first observed it on Good Friday, the 9th April on the basis of information provided in IAU telegrams downloaded from RGO and Starbase One by modem link. However, we were unable to confirm the 11th magnitude object until the 15th April, when a better finder chart became available through the JAS News Bulletin.

Thanks for support

The following companies and organisations gave us support in the construction of the new building. Without their considerable help it would have been much more difficult, and certainly more expensive.

Carpet Selection Centre (for providing flooring for just the cost of installation).

A.F. Le Prevost General Building (for construction work at reduced rates).

Jeffreys Service Stations Limited (for a generous donation of £75).

John Lesbirel plant hire (for providing digger services free of charge).

Le Tricoteur and Co. Ltd. (for special order Guernsey at wholesale price).

North Quay Marine Ltd. (for advice on winch).

F.W. Rihoy and Son (for electrical goods free of charge).

Ronez Limited (for concrete free of charge).

Sign Service Co. Ltd. (for plaque free of charge).

States Board of Employment, Industry and Commerce (for timber at cost).

States Electricity Board (for planking from packing cases).

States Water Board (for pipe at cost - for the telescope pier).

States Works Department (for angle iron - for roof rails).

Vista Windows Ltd. (for door and frame free of charge).

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A Guernsey for Patrick

While Patrick Moore was here we presented him with a Guernsey as both a souvenir of his visit, and as a (slightly) belated birthday present - it was his 70th birthday on the 4th March.

However, to get the right size I had the problem of finding out his chest measurements, preferably without him finding out that I was finding out (if you see what I mean). How to do this? Well, a call to his friends the Maunders (Michael is also a member of the Astronomy Section) put me in touch with another friend, Rossie Atwell, Business Secretary of the British Astronomical Association. She in turn put me in touch with a relative of his former housekeeper, and she contacted his tailor.

The answer? 56 inches!

Star Nights

The public Star Nights and Telescope Surgery held at the end of March were counted as successful, despite the poor weather. On the 27th about 30 people came, none on the 28th, seven on the 29th, and on the 30th some 50 people turned up. Most had a chance to see at least the Moon, many also saw Jupiter and its moons, and some saw other objects as well. On the first three nights the sky cleared at about 10 p.m., after everyone had gone! On the 27th we observed Io exiting from occultation (i.e. coming out from behind Jupiter).

There was good support from members. Gareth's and David's display was on show, and slides and videos were shown. Practical advice was given on several telescopes. £30 was made from the event.

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Recent observations

The advent of the 14-inch telescope, accurately aligned and levelled, and with usable setting circles, has been made good use of, especially by Daniel Cave. He has observed a large number of objects, and taken photographs, especially of Jupiter.

On Good Friday he and David Le Conte observed what appeared to be a dark spot on Jupiter (in addition to the Great Red - now Orange - Spot). It was not a moon's shadow or a moon against the disc.

On the night of the 11th/12th April Daniel observed no less than 17 deep-sky objects in half an hour, including faint NGC objects. This feat was only possible with the use of the setting circles.

Open University course

Where did the Universe come from? How will it end? How are the stars born? How rare are planetary systems? Why aren't all planets like the Earth?

These are some of the big questions to be tackled by a brand new astronomy course which will be offered by the Open University next year. Called *Astronomy and Planetary Sciences*, it has been compiled by Jocelyn Bell Burnell (of pulsars fame), and runs from February to October 1994. It is a second level, half credit course, involving approximately 7 hours of study per week.

At least one Section member is planning to sign up for it, and if several members were interested there would be benefits in group discussion. Details are available at the Observatory. It does not assume any previous knowledge of astronomy, and is not very mathematical.

Comet Bamboo?

Some of the bamboo in Saumarez Park is due to be replanted. *Arundinaria japonica* blooms every 75 years and last bloomed in 1986. Does that sound familiar? And what on Earth does it have to do with astronomy?

Of course, Comet Halley last appeared in 1986, and returns every 75 years. Could there be a connection?

Seems doubtful, but that is for you to discover. There will be a (small) prize for the most plausible, fanciful or humorous explanation of this curious fact. Entries by the end of May, please. **DLC**

Education activities

On the 4th March I gave a talk to pupils at La Houquette Primary School, and the same evening about 35 of them came to the Observatory. Despite 95% cloud cover they were thrilled to see a glimpse of the Moon through the 11-inch telescope. We have tried on several occasions to have Blanchelande School pupils at the Observatory, but the weather has always intervened.

Remember that if you know of a school or youth group (or even an adult group) that would be interested in looking through the telescopes, arrangements can usually be made. **DLC**

Star chart published

Members may have noticed that Geoff Falla's splendid star chart was published in the Guernsey Evening Press on Monday, the 13th April. Hopefully, this will be a regular event. His new chart for May is included with this newsletter.