Advertisements

Do you have anything for sale, or do you want anything (preferably, but not necessarily astronomical)? Advertise here - no charge.

For sale:

4-inch Prinz Optics Newtonian reflector, 1000 mm focal length, approximately 20 years old, in original box with original instructions, eyepieces, etc. Offers to Jason Monaghan, tel. 720841.

Needed for the Observatory:

Television set

Vacuum cleaner

Computer (PC)

1994 Subscriptions and Astrocalendars

Subscriptions for 1994 newsletters will be £5.00 (£3.00 students and OAPs). Don't forget that you get a free Astrocalendar. The 1994 Astrocalendars are now available, so why not pay your subs now? Give or send payment to the Section's Honorary Treasurer, Peter Langford, 3 Cameron Place, Upper St. Jacques, St. Peter Port. Cheques should be made payable to "La Société Guernesiaise Astronomy Section". ¤

Sagittarius Compendium

A Compendium of major articles which have appeared in Sagittarius in 1993 is planned to be published in the new year. The cost is expected to be about £2.00. ¤

Astronomy Section Officers

(and telephone numbers)

Section Secretary: Geoff Falla, 724101

Honorary Treasurer: Peter Langford, 720649

Education Officer: David Williams, 725088

The next newsletter will be published early in the new year. The deadline for publication materials is 10th December.

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Sagittarius

The Newsletter of the Astronomy Section of La Société Guernesiaise

November/December 1993

Forthcoming events

Mercury and Pluto
by Frank Dowding
Tuesday, 23rd November
8.00 pm at the Observatory

Total Lunar Eclipse
Monday, 29th November
(night of 28th/29th)
4.00 am at the Observatory

Quiz and Supper Evening
Tuesday, 14th December
7.30 pm at the Observatory

Annual Business Meeting
Tuesday, 25th January
8.00 pm at the Observatory

In this issue

Is anybody there?
The Hubble Space Telescope - Pt II
Amateur radio astronomy
N. America Nebula photographed
A visit to Birr Castle
Orion - the Hunter
Star chart for November/December

Inside

Details of Section events	Pages 2 & 3
1994 Programme	4
Educational activities	4
Sagittarius - a year on	4
Is Anybody There?	5
30 Days Hath September	5
The Hubble Space Telescope - Part II	6
Review - Astronomical Algorithms	10
Orion - the Hunter	Centre
November/December star chart	inserts
Amateur Radio Astronomy	11
A Visit to . . . Birr Castle	16
Double Summer Time - Follow Up 2	18
Asteroid Observing for the HST	18
Falklands Star Charts	18
More Lively Limericks	19
The Man in the Street	19
Shakespeare's Astronomy	19
Round up . . . Round up . . .	20

Mercury and Pluto

At 8.00 pm at the Observatory on Tuesday, the 23rd November, Frank Dowding will talk about these two smallest planets. In recent years Frank has given us talks about every one of the planets - except these two.

At first sight there appear to be many similarities between Mercury and Pluto, but, as Frank will show, there are considerable differences. In particular, there are surprising differences in the motions of the planets, and Frank will also highlight what we know about the planets themselves, and suggestions as to the possible origin of Pluto.

Frank will use a few slides to illustrate his talk. Inevitably, his talks have always taught us something new about the subject. Undoubtedly, few of us know much about Mercury, and even less about Pluto, so this is our chance to correct our ignorance. ¤

Total Lunar Eclipse

In the early morning hours of **Monday, 29th November** there will be a total eclipse of the Moon. Times (am) are as follows:-

Moon enters the penumbra	3.27
Moon enters umbra	4.20
Totality starts	6.02
Middle of eclipse	6.26
End of totality	6.50

The Moon will set by 8.00 am, before it fully leaves the umbra.

The eclipse will be observed from the Observatory, weather permitting.

There is a partial lunar eclipse on the 25th May 1994, but the next total eclipse is not until the 4th April 1996. ¤

Quiz and Supper Evening

At 7.30 pm on Tuesday, 14th December, at the Observatory we will hold our annual quiz and supper evening. **Please note the start time - earlier than our usual meetings.** Daniel Cave will be the quizmaster this year.

The evening will consist of a pot-luck supper, eaten during the quiz. Please bring a dish, preferably one suitable for eating with the fingers. Also bring something to drink. There will, of course, be a Christmas flavour to the evening.

Everyone is welcome to this event. Don't feel you have to know a lot about astronomy - it's not a test! The idea is that we all learn something from the quiz. There will be a variety of questions, easy as well as more specialist ones, and perhaps a few strange ones thrown in.

To whet your appetite, here's one, the answer to which was in a recent edition of *Astronomy Now*. The answer is at the bottom of page 3.

There is an asteroid called Mr Spock. What is it named after?

(a) A character in Star Trek.

(b) The author of books on child care.

(c) A ginger cat. ¤

Advance notice of January meeting

A date for your (next year's) diary. The Annual Business Meeting will be held on Tuesday, the 25th January 1994 at 8.00 pm at the Observatory. This will provide all members with the opportunity to discuss finances, the programme, format of meetings, and Section activities. ¤

The "pudding" is proved

Several members took the opportunity of visiting John Taylor's home for a view through his new 6-inch refractor, described in the last issue of Sagittarius. Those who did were rewarded by excellent views of Saturn, as well as some other objects.

I saw the Dumbbell and Ring Nebulae, and was most impressed by the good contrast, despite a less than perfect sky. The detail in Saturn's image, although the planet was low in a bright sky, was remarkable, and the Cassini Division showed up clearly.

John's collection of eyepieces (15 of them, including superb wide-field Plössls) would be an asset to any telescope, but used with the optics of the 6-inch they make an unbeatable combination. ¤ *DLC*

Videowatch and Starwatch

Some 60 - 70 people, including many children, came along on Tuesday the 19th October. Four extracts of videos were shown: the graphic guide to the autumn and winter sky, the Earth from space, Saturn, and the 1991 solar eclipse.

As is usual with our open evenings, the weather was not very cooperative (the Monday was completely clear!), but everyone had a glimpse of Saturn though the 14-inch and 11-inch telescopes, and many had a view of the Andromeda galaxy and the Moon. Saturn was a beautiful sight and thrilled everyone who saw it.

We all concluded that it was a very successful and worthwhile event. Many thanks to all who helped, especially those who served refreshments, sold publications and answered numerous questions. ¤

La Société Open Day

The annual Open Day was held on Sunday the 26th September at St. Martin's Church Hall. The Astronomy Section had an excellent display - probably the best of any section. Many thanks to David Williams for doing such a good job on it. Specially featured were examples of Daniel Cave's photography with the 8-inch Schmidt camera (one is published in this issue).

Attendance was not overwhelming - probably due at least in part to the foul weather. Our stall was manned throughout the day by the Secretary, Geoff Falla, and included sales of our usual publications. ¤

Space in the 60's

Members heard David Le Conte talk of his work tracking satellites for NASA and the Smithsonian Astrophysical Observatory in Florida, Boston, Hawaii and Arizona. David also touched on earlier satellite work with the Royal Observatory Edinburgh, the University College of Wales in Aberystwyth, and later work with the Smithsonian Institution and Kitt Peak National Observatory, and showed examples of photographs taken, including the Apollo spacecraft. Many original materials and documents were shown. ¤

Answer to quiz question:

The answer is (c). Asteroid 2039 was discovered in 1971 by a Mr. K. Gibson. He named it after a ginger cat. The cat was named after Mr. Spock of Star Trek. This curious fact was reported by Patrick Moore in his "Night Sky" column in the August 1993 issue of *Astronomy Now* magazine. ¤

The 1994 programme

The 1994 programme is now being compiled. We anticipate another full year with the usual set of activities. However, more speakers are needed. Often the best way of learning something is to give a talk about it, so please put your name forward. If you would prefer, it need not be in the form of a formal lecture, but simply a round-table discussion which you could start off.

For example, you could talk about the history of astronomy (or perhaps an account of one astronomer's life), or a spacecraft, or about a book or article you have read. There is plenty of material available at the Observatory to help you - books, magazines, articles, and files of information.

Also, we need to know what **you** would like to see in the programme. Your suggestions are always welcome. ¤

Educational Activities

Following the articles on education in the last issue, we have certainly been active in this area. David Williams is giving a course to Boys Brigade candidates for their astronomy badge. David Le Conte is helping two Duke of Edinburgh Award candidates, and gave a talk to 20 pupils from Oakvale School at the Observatory.

At 6.15 pm on Wednesday, the 10th November we are expecting about 24 Brownies at the Observatory. They will, of course, be looking at the stars if it is clear. If not, slides will be shown, and they will be able to see our telescopes. Help from members will be appreciated for this event. If clear, it is likely that some parents will stay also. ¤

Sagittarius - a year on

Sagittarius is now one year old. I started it in January with some trepidation, not knowing whether the necessary articles and other materials for it would be forthcoming, and not knowing what kind of reception it would get from members.

The response on both counts has been excellent. Members have rallied by producing a string of interesting articles, and the reception has been good. From a small first edition, it has grown to a substantial publication.

David Williams's series of articles on the origins of our units of time, Mark Humphrys's series on constellations, Daniel Cave's articles on active optics and the Hubble Space Telescope, the series by several members on visits to places of astronomical interest, Geoff Falla's star charts, and a variety of photographs have all demonstrated the willingness of members to contribute their time and effort to make this a first-class publication.

Can we keep it up? Only time will tell. But it really depends on you, the member. If you want it to continue, it can only be by having a constant flow of material for inclusion. There is something quite satisfying in seeing your name in print alongside a feature article or book review, so please keep the material coming in.

Above all, this is **your** newsletter, and I would pleased to have feedback from members it. How can it be improved? Is the format all right? Is it readable? Are the articles too technical, not technical enough, too long or too short? Would you prefer to see more photographs? Would you like more articles on basic astronomy? Do let me know, so next year's can be even better. ¤ ***David Le Conte (Editor)***

Is Anybody There?

David Williams puts forward a personal, and possibly controversial view. What do you think? It would be useful to hear, and publish other members' reactions.

Antony whetted our appetites with his talk about UFOs, and any consideration of this topic eventually brings us to the questions "Is there anybody there, and is there life elsewhere in the Universe?".

I present here a personal view, for I believe without question that there are other forms of life in the Universe besides our own humankind.

When we consider the ages of the Universe and of the Earth, and the age of Homo sapiens, then it is surely an act of utter conceit and egotism to suppose that we are the only life-form around. As a species we are quite young, and as a so-called civilised being we date back no more than a few thousand years - not even equivalent to a speck of dust on the floor of cosmological history!

The horizons of knowledge and understanding are being pushed further away every day. We are now accumulating data via the Space Telescope and other probes at an enormous rate. Much of it will not be analysed for years to come, so great is the information we now have. The days of considering the Earth as the centre of the Universe are gone; humankind is but one rather insignificant species of life throughout the Universe.

We are fortunate to be alive at a time when science continues to unravel many of the mysteries of the cosmos. I suppose also in one way we are less fortunate, as we have the potential at our disposal to see into the future and so imagine better than our »»

ancestors the paths along which we may develop. This is an exciting age. We are still coming to terms with nuclear power and its uses, both peaceful and warlike. We have a better understanding of our environment and our impact upon it. Before we explore deep space, as surely we shall one day, we must firstly put our own house in order. Once that is completed I am certain humans will then explore the great mysteries of space.

The great discoveries of space lie in the future, not in my lifetime or, I suspect, in my grandchildren's (if they ever exist) lifetimes, which only puts us into the years of the mid to late 21st century. I say this as the present environmental difficulties will take their time to be resolved. However, I am certain that humans will explore deep space, and will come into contact with other life-forms - unless of course they decide to contact us first, but that I doubt, for we are still but a brash and poorly disciplined species with much to learn and to respect. ¤

David Williams

30 Days Hath September - But How Many Moons?

September was unusual in having two full moons - on the 1st and 30th. How often does this occur; i.e. how frequently are there two full moons in a month?

Daniel Cave turned the question around, and asked: is it possible to have a month with no full moons at all? As the average period between full moons (the synodic period, or lunar month) is 29.53059 days, it is possible for February to have no full moons. Daniel hopes to work out if and when this happens. Watch this space! ¤

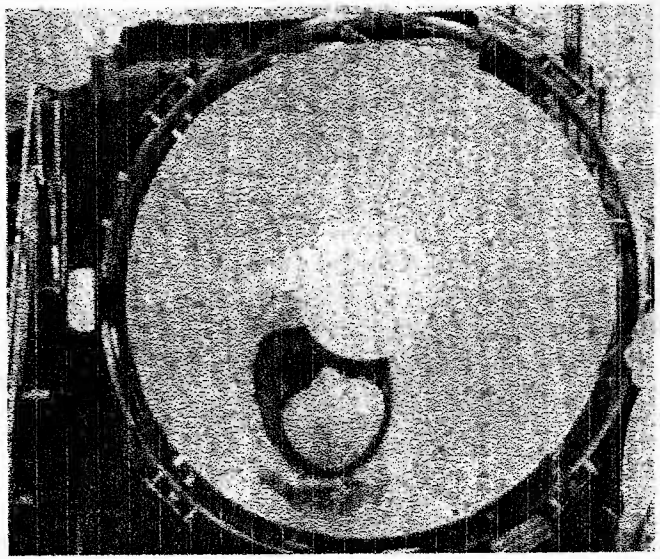
The Hubble Space Telescope - Part II

In December the space shuttle Endeavour is scheduled to be sent to effect modifications to the Space Telescope. In Part I Daniel Cave described the history and design of the Telescope. In Part II he describes the launch, the subsequent problems, and the plans for the cure.

On April 24th 1990 the HST was taken into orbit by the shuttle Discovery. It had to reach a higher altitude than usual, 610 km as opposed to 220 km. This was to lessen the atmospheric drag on HST. The next day, using the robot arm, the telescope was lifted out of the cargo bay. After a few technical difficulties it was set free. The shuttle returned to earth on the 29th April after a quick check-out of the telescope went to plan. Over the next few weeks the HST would be put through a complete series of tests before being handed over to astronomers.

After trying in vain for weeks to focus the telescope sharply, NASA announced on June 26th 1990 that there was a serious problem with the optics. It appeared that the telescope suffered from a textbook case of spherical aberration. The outer part of the mirror had a different focal length to the central region, causing the image created by the periphery of the mirror to come to focus 4cm behind the image made by the centre. This means that 70% of the light from the star falls within an observed radius of 0.7 arc second, rather than the expected 0.1 arc second. The image still has a 0.1 arc second core, but it contains only 15% of the light; the rest is spread into a halo with a diameter of 1.5 arc seconds.

An investigation committee was rapidly set up to find the cause of the aberration. By September 1990 the finger was firmly pointing at a device known as the reflective null corrector, used to test the mirror during the precise stages of manufacture. An error of 1.3mm in the spacing of a lens was found, and this could fully account for the spherical aberration in the primary. A supposedly less accurate refractive null corrector was used in the testing; this corrector revealed the problem but the management decided to ignore these results and put their faith in the defective corrector. Perkin Elmer had successfully manufactured the world's most precise telescope mirror - to the wrong shape. »»



The faulty mirror

The impact on science is great. Faint objects, or objects in crowded fields, that were to be the targets at which the HST excelled, are now the most hard hit by the problem. Image processing techniques can be used to deconvolve images, but exposure times have to be increased, and this just puts the faint distant quasars and galaxies out of range. The two spectrographs and photometer are less affected than the two cameras, but again crowded fields and faint objects cause problems.

The telescope observing time was initially rescheduled to make the most effective use of the instruments. However, after investigating various computer processing techniques more thoroughly it was found that as much as 80% of the planned science could be carried out.

There have been many successful observations carried out to date. One of the first was the clear separation of Charon from Pluto. In the past, from Earth, Charon and the planet had appeared "stuck" together (due to the lower resolution through the atmosphere). A picture taken with the FOC clearly separated the two objects. Such observations now allow astronomers to refine the orbit of Charon.

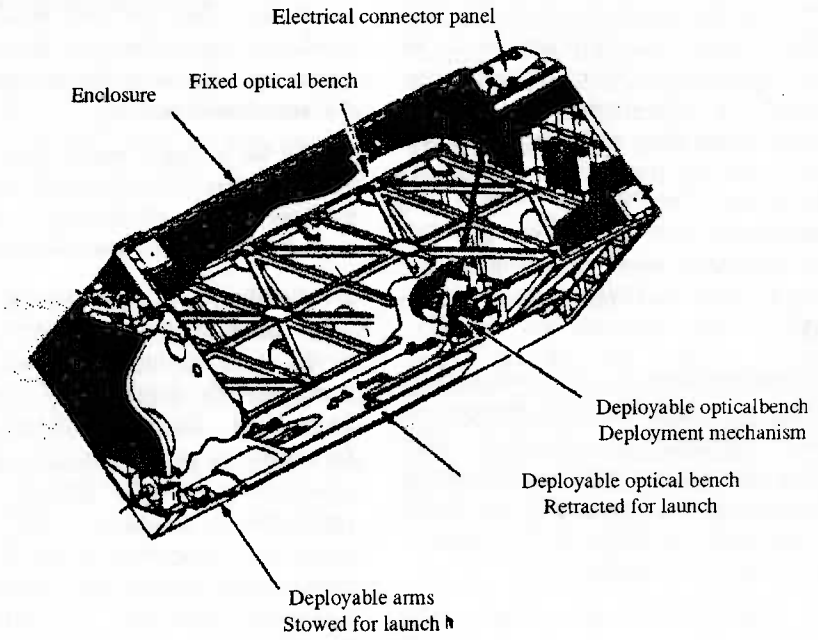
In late September 1990 a major disturbance in Saturn's atmosphere occurred. With a rapid schedule change, HST was there to observe it. The result was a time-lapse "movie" clearly showing the occurrence, a large white spot, swirling in Saturn's atmosphere. HST obtained the best observations of this rare event.

Another interesting observation was that of the supernova SN 1987A. Made in August 1990 using the FOC, the image shows a clear "smoke ring" of gas ejected by the star before it went supernova. This observation has not been equalled from earth as no telescope has adequate resolution. At its widest the ring is only 1.6 arc seconds across.

It will be a while before these and the many other observations are fully understood, but the quality of data is so high that discoveries are certain to follow.

Deconvolution is only a stop-gap measure. After the null corrector had been identified as the cause of the error, opticians better understood the problem and how it could be repaired. Bringing HST back to Earth for repair was rapidly ruled out, as the cost would have exceeded that of making a replacement telescope. The simplest instrument to repair was the WF/PC. A replacement WF/PC was already under construction at launch. This was to correct for a sensitivity problem on the CCDs. By simply replacing 8 small mirrors in this camera with compensating ones, the aberration could be eliminated, restoring the full potential of the instrument. Other second generation instruments such as the Space Telescope Imaging Spectrograph (STIS) and the Near-Infrared Camera (NICMOS), can also be fitted with corrective mirrors.

The plan to correct the existing instruments is to remove one of the science instruments (HSP) and replace it with a new axial "instrument"- COSTAR (The Corrective Optics Space Telescope Axial Replacement). This device will deploy corrective optics into the optical train to cancel the aberration. While not as effective as specially corrected instruments, 80% of the planned efficiency should return. »»



COSTAR - the cure for the Hubble Space Telescope

In addition to COSTAR and WF/PC II, new "vibration-less" solar arrays and four new gyroscopes will be fitted in a busy shuttle mission scheduled for December 1993. From then on HST will be performing very nearly as it was meant to. The distant quasars and galaxies will be within its reach, and the challenging project of looking for extraterrestrial planets will be feasible. The most rewarding results will be those that are unexpected.

If there is anything to be learnt from the whole affair, it must be that when a project of this ambition and complexity is attempted things will go wrong, and that inefficient management can turn a small technical problem into a major scientific disaster.

APPENDIX

In the shadow of the optical problem there were a number of smaller ones which also affect operations. The first one to surface was noticed on the ground before launch. It was found that the sensitivity of the WF/PC varied over time, causing inconsistent results. This was traced to some contamination in the 8 CCD chips. The solution was to cut a hole in the casing of the camera so that the CCDs could periodically be bathed in direct sunlight. This drives off the contaminant and the sensitivity recovers. This process is ongoing, however, as the contaminant is trapped inside the CCD, and so it recurs at a later time. »»

The next problem was found before the optical problem and caused much concern. It was noticed that when the telescope moved between its "day" and "night", an oscillation was set up in the solar array, causing the whole telescope to move by 0.1 arc second, smearing any image being formed at the time. The wobble was predictable, however, so new software was sent up to the telescope to anticipate and lessen the problem.

A more serious problem was a sequence of gyroscope failures. The telescope has six, of which three are used at a time to give the telescope its sense of direction. Within two months of each other in 1991 two gyroscopes failed totally and a third began to misbehave. The remaining three continue to work correctly, and it is thought that the problem is due to the difference in manufacture of four out of the six gyroscopes. It is hoped that the remaining gyroscopes can hold out until replacements can be fitted.

The final major problem was an intermittent power failure on part of the GHRS. This occasionally halves the spectral range of the instrument. While there is a backup power supply, officials do not want to risk switching to it, as it means that all the other instruments would also have to switch to theirs.

BIBLIOGRAPHY

How to Make a Telescope, by Jean Texereau. 2nd English Edition 1984

The Space Telescope, NASA 1975

Sky and Telescope:

Astronomers, Congress and the Large Space Telescope, April 1985

HST, Astronomy's Greatest Gambit, May1985

Hubble Space Telescope Takes Wing, July 1990

Hubble Telescope Sees First Light, August 1990

The Hobbled Space Telescope, September 1990

Space Telescope: Picking Up the Pieces, October 1990

News Notes / Astronomy Express, November 1990

Hubble's Agony and Ecstasy, January 1991

Astronomy Express, March 1991

HST Update: Science Amid Setbacks/Astronomy Express, September 1991

Astronomy Express, October 1991

News Notes, December 1991

Nature:

Commentary, 26 April 1990

News, 5 July 1990

News, 19 July 1990

News, 23 August 1990

News, 30 August 1990

Astronomy:

Building the Space Telescope's Optical System, January 1986

Raising Hubble, August 1990

Hubble's Optical Fix, November 1990

Scientific American:

The Space Telescope, July 1982 ¤

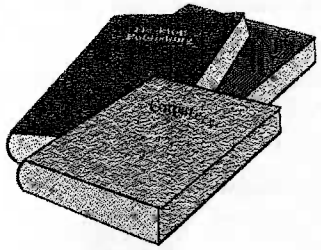
Daniel Cave

The November 1993 issue of Sky and Telescope has two articles about the repair of the HST. There is also a huge collection of documents related to the HST in the Section's Library, including newsletters and many other publications and photographs from the Space Telescope Science Institute. Watch out for news, hopefully in December, of the repair mission. ¤

Book Review

Astronomical Algorithms

by Jean Meeus



This book is not for the faint-hearted! At first sight it is a mass of equations, with some text, a few illustrations, and pages of tables. For the mathematically inclined, however, it is a marvellous book.

As the author says in the Introduction:

"*Astronomical Algorithms* intends to be a guide for the (professional or amateur) astronomer who wants to do calculations. An "algorithm" (from the Arabic *Al-Khãrezmi*) is a set of rules for getting something done; for us it is a mathematical procedure, a sequence of reasonings and operations which provides the solution to a given problem."

Algorithms are especially used by computer programmers, as they provide a step-by-step method of processing an input to obtain a required output. Thus, the book gives methods of calculating, to a high degree of accuracy, everything from the date of Easter to the positions of the Sun, Moon and planets, and even the orientation of the rings of Saturn.

Its 56 chapters contain much else besides, including sidereal time, rising, transit and setting calculations, precession and sundials. Each algorithm is fully described, and illustrated with examples of actual calculations. This is very useful for debugging computer programs, as one can check the progress of the program stage by stage.

»»

Many of the algorithms are by no means trivial, as they take many factors and perturbations into account. The calculation of the position of the Moon, for example, is highly complex (although the author says it is simplified!). The algorithms are also very much inter-related - they do not stand alone. Thus in calculating, for example, solar coordinates, one has to refer to other calculations to obtain specific terms for use in the algorithm.

Nevertheless, the book is excellently laid out and well written. If one is prepared to spend the time, a lot can be learnt about the background to the motions of celestial objects. The descriptions start from fundamentals. I particularly liked the introductory chapters on hints and tips, accuracy, interpolation, curve fitting and iteration.

Jean Meeus, a Belgian meteorologist, is well known for his accurate calculations of astronomical phenomena. He is frequently referred to in the astronomy magazines, often providing historical positions of objects hundreds of years ago or in the future. He has published works on eclipses and astronomical tables.

In summary, a superb and essential book for the specialist.

David Le Conte

Astronomical Algorithms costs £20.95, and is published by Willmann-Bell (ISBN 0-943396-35-2). I bought my copy from Rosemary Naylor (Tel. 0706 817767). A computer disc for PCs is available. ¤

Amateur Radio Astronomy

Recently I placed an advertisement in the American magazine *Astronomy* asking for correspondence with people interested in radio astronomy. I have had several replies from places as far afield as West Germany, Venezuela and the USA, all of them very helpful, sending me details of their own systems, magazine articles on radio telescope construction, etc. One reply in particular was from Vincent Caracci, Secretary of the Society of Amateur Radio Astronomers, SARA.

As the name suggests, SARA is a group of enthusiasts around the world who observe, not only at optical wavelengths, but also at radio wavelengths. It was formed in 1981, and currently has over 300 members. You may have seen their adverts in the "Readers Exchange" column in *Astronomy* from time to time.

When I first became interested in radio astronomy I had imagined that amateur efforts, at best, would be limited to connecting an antenna to a radio receiver and pointing it at some bright source, such as the Sun, and listening to the noise. However, glancing through the Society's journal, *Radio Astronomy*, I soon realised that my preconceived ideas were very wrong and that amateur radio astronomers have developed some quite sophisticated systems.

For instance, Chuck Forster of Wisconsin is currently observing the Orion region of the sky at a frequency of 775 MHz, using two parabolic dishes connected together as an interferometer. The dishes are 16 and 12 feet in diameter. All the data is logged automatically onto computer. Steve Preflatish of Indiana has a home-built 24-foot dish mounted in the same way as the Arecibo radio telescope. Because the dish is fixed in place, observation is carried out by monitoring the sky as it drifts in front of the dish. He is currently observing at two frequencies, 611 Mhz and 1420 Mhz, the latter frequency being the 21 cm hydrogen line.

Robert Sickels of Florida uses two 12-foot parabolic dishes arranged as an interferometer, and observes at a frequency of 749 Mhz. He is particularly interested in High Energy Pulses (HEPs) which have been detected over the last few years by Society members, and is attempting to correlate these with gamma ray bursts as detected by the Gamma Ray Satellite. Jim Stewart of Connecticut is also studying the Orion region at 144 MHz and 432 MHz. He is using yagi antennas (similar to a TV aerial) instead of a parabolic dish.

Members are also observing at microwave frequencies. Charles Osborne (Georgia) is currently studying the Cygnus region at 3688 MHz (a wavelength of around 8 cm, about the same as that found in household microwave ovens). Osborne is also working with another SARA member, David Moore, on a project to build a fully steerable 100-foot dish. It seems that aperture fever affects even radio astronomers! Currently the dish is up and running, though some of the electronics are still to be completed before it is fully operational.

Outside of the US, Arpad Cserkuti of Sweden uses four 10-foot long yagi antennas mounted together as a fully steerable array. He observes at 435 MHz, and records the data onto paper trace.

»»

This has just been a brief mention of some of the observers that are mentioned in the journal. There are others who are carrying out solar observations, or watching (listening to) Jupiter, or carrying out all-sky surveys at different frequencies.

Talking of Jupiter, one reply I had to my advert was from Diana Norman in Florida. She has a home-built 12-foot parabolic dish made out of chicken wire, together with a home-built receiver. Her current project is studying the interaction between Jupiter and its moon Io. It appears that at certain times strong radio signals can be detected emanating from Jupiter. These relate to certain positions in the orbit of Io around its parent planet.

Each year SARA holds its annual conference at the National Radio Astronomy Observatory, Green bank, West Virginia, attended by both amateurs and professional observers. (The Observatory is the location where the large 300-foot diameter telescope collapsed back in November 1988. It is currently being replaced by a state-of-the-art off-axis 100m by 110m dish.) SARA also offers, for people like myself who have very little knowledge of electronics, plans so that complete radio telescope systems can be built at a very modest cost. I hope to be building one of these systems in the near future,

If anyone is interested in further details about the Society, they should write to the Secretary, Vincent Caracci, at:

247 N Linden Street

Massapequa

NY 11758

USA

Mark Humphrys

The following is some information about radio astronomy provided by the Society of Amateur Radio Astronomers.

What is SARA?

SARA is a dedicated group of people that formed an international society to learn, trade technical information, and do their own observations of the radio sky. It is a scientific non-profit group founded for the sole purpose of supporting amateur radio astronomy. The group consists of optical astronomers, ham radio operators, engineers, teachers and non-technical members. Many members are new to the field of radio astronomy, and membership is extended to all who have an interest in radio astronomy.

Why radio astronomy?

About 65% of our current knowledge of the universe has stemmed from radio astronomy alone. The discovery of quasars, pulsars, black holes, the 3K background from the "Big Bang", and the discovery of biochemical hydrogen/carbon molecules are all the result of professional radio astronomy.

Why amateur radio astronomy?

Large professional radio observatories concentrate on deep sky objects for relatively brief periods of time. It's sort of like looking at the universe through a straw. The amateur, on the other hand, looks at broad areas of sky for long periods of time. Although amateurs cannot compete with professional astronomers, they do have some benefits. Modern state of the art low noise receiving equipment now enables amateurs to do viable and useful work. Moreover, the amateur has unlimited time (*wish that were so! - Ed.*) which may be devoted to a single observational project. »»

How do amateurs do radio astronomy?

Radio astronomy may be conducted using wither imaging or non-imaging techniques. Non-imaging radio astronomy includes the observation of radio noises from Jupiter, collection of solar flare data, and meteor infall counts. Non-imaging radio astronomy is conducted with very low cost receiving equipment and relatively simple antenna systems. It usually involves modified communications type receivers which receive a narrow band of radio frequencies.

Imaging radio astronomy involves antennas of rather large size, requires radio quiet locations and broadband receiving equipment. The reason for using the broadband equipment is that discrete radio objects radiate over a large spectrum. Therefore a greater receiver bandwidth increases the amount of energy received from the object.

What are amateurs looking for?

The aim of the radio amateur is to find something new and unusual. Just as an amateur optical observer hopes to notice a supernova or a new comet, so does an amateur radio observer hope to notice a new radio source, or one whose radiation has changed appreciably.

What is the purpose?

The purpose is the same as for any scientific investigation. That is, to examine the universe, make any discovery possible, and let your work be known. This is accomplished by patient, methodical data taking, careful analysis without personal bias, and the publication of the result. For amateur radio astronomers, the SARA Journal is the one medium for publication.

What does the average amateur radio telescope consist of?

In general, the amateur radio telescope consists of a good antenna system, a sensitive, stable, low noise receiver, and various output devices. The output may take the form of a strip chart recorder, a voltmeter or a data logging computer.

What kind of observational programs are sponsored by SARA?

SARA is encouraging radio observations of the galactic centre and the Orion complex for anomalous pulses which are believed to originate from these sources from time to time. The galaxy centre mechanism may involve a black hole. In addition, some members of SARA are involved in radio observation of the Sun for flare activity at very low frequencies. Other members are involved in a supernova patrol.

Does SARA support SETI?

The Search for Extraterrestrial Intelligence (SETI) is pursued by a few SARA members, While the Society does not especially encourage SETI work with instruments of limited capability, it is not discouraged either.

How do I get started?

Just as a long journey begins with the first step, the project you elect must start with a clear idea of your objectives. Do you wish to study the Sun? Jupiter? Make meteor counts? Do you wish to engage in imaging radio astronomy? What you will decide will not only determine the type of equipment you will need, but also the local radio spectrum. The following is some specific information which may help you decide on a project commensurate with your technical abilities. »»

VLF solar flare observations

For Very Low Frequency (VLF) solar flare observations you will need a strip chart recorder and a radio receiver capable of operating in the noisy 20 to 100 kilohertz radio band. These receivers are quite simple and may be home constructed. SARA can supply the plans for several types of receivers.

There are two equally effective ways to do this work:-

1. The receiver is tuned to a locally usable part of the radio spectrum, and monitors earth atmospheric noises originating from lightning strikes around the equator. These are conveyed around the Earth's surface by the ionospheric D layer. A solar flare causes X-rays to strike this D layer, greatly enriching its electron count. This makes the layer a much more efficient waveguide for this noise, and the result is a sudden enhancement of atmospheric noise detected by the receiver and the strip chart recorder.

2. An equally effective method in the same radio band is to tune up on a distant marginally received radio beacon, and look for enhancements of the signal. The end of a solar flare produces the same data, i.e. a sudden rise in received energy, tailing off to the normal level in a period from 15 minutes to an hour as the D layer once again assumes its normal equilibrium.

Solar flare work in other bands

Solar flares may also be monitored in all of the free shortwave bands as enhancements of radio noise. In general, you would need a good communications receiver, operated without limiters (AGC turned off), a strip chart recorder, and perhaps an audio cassette recorder.

Meteor counts by radio

Counts of meteor infall provide valuable data to Meteor Societies. Radio detection of meteors is about 10 times more effective than optical observations. Moreover, this may be done in the daytime hours. The arrival of a meteor in the Earth's upper atmosphere produces a sharp pinging sound of about a second's duration. A good receiver tuned to a marginally received radio beacon and a strip chart recorder or a computer are all you need to get started. A cassette audio recorder is useful during strong meteor showers.

Radio noise observations from Jupiter

Sporadic noise may be monitored from Jupiter with a good antenna system and a receiver tuned to a "dead" portion of the 18 to 22 MHz radio band. Owners of such receivers may have already heard noise from Jupiter without realising the source. Once heard it is easily identified. It sounds like frequent rushes of noise, like rapid sea surf, punctuated by a quivery subsecond structure. If correlated with transits of Jupiter's inner moon, Io, the data is useful and publishable. Observing is difficult or impossible for three months of the year when Jupiter is close to the Sun (an active Sun can confuse the data).

Imaging radio astronomy

This work is best done at the VHF, UHF and microwave frequencies. Paraboloid antennas become viable options at about ½ meter wavelengths and below (600 MHz and above). Above 600 MHz you may use phased arrays of antennas such as yagis and helices. Read-out equipment includes a DC amplifier, strip chart recorder or a computer. Audio monitoring is also useful to determine if the received noise is »»

truly celestial. Best results for this type of work will only be achieved in radio quiet locations. If the local environment is noisy, it is best to move the observatory to the country.

SARA provides assistance and advice to anyone interested in pursuing radio astronomy, and circulates technical information to help amateurs obtain good low-noise equipment or to build their own units. The cash investment in radio astronomy equipment need not exceed that of any other hobby.

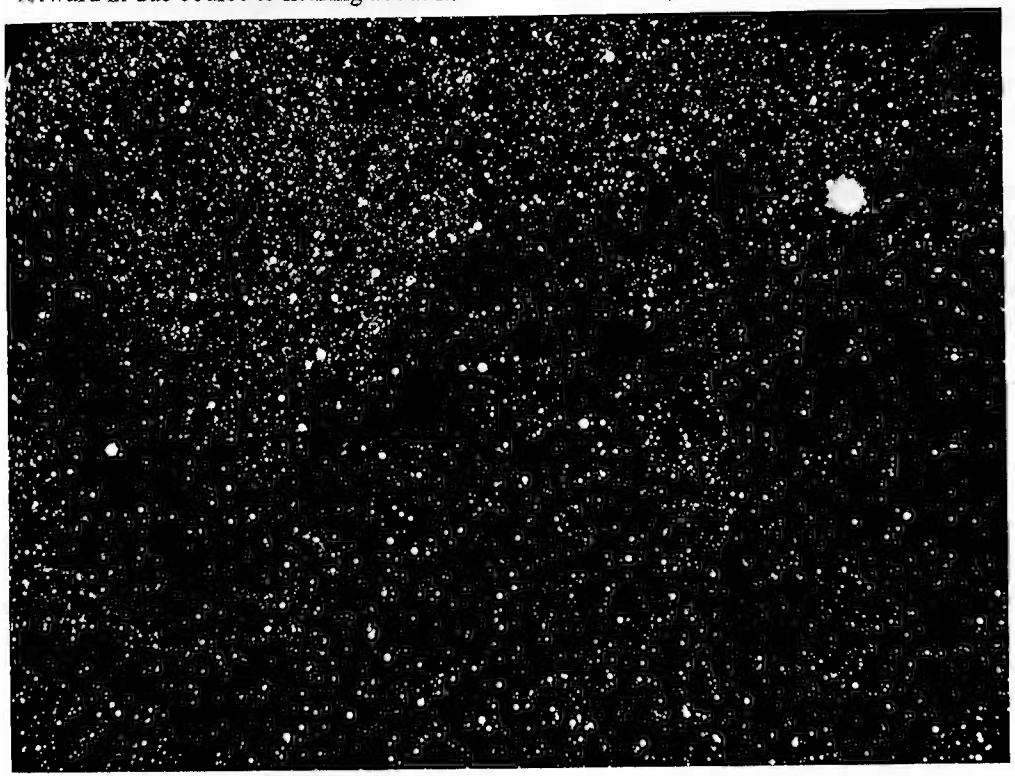
Mark has indicated that he is particularly interested in radio imaging. We wish him well with this exciting project, and look forward in due course to hearing about it. ¤

Photographs galore

Daniel Cave has spent virtually every clear night this past summer in perfecting his photography techniques at the telescope. This perseverance has paid off, as can be seen by the excellent photograph below.

Daniel has used a variety of techniques: piggyback, prime focus and eyepiece projection, all with the 14-inch telescope. But it is with the use of the 8-inch Schmidt camera, mounted with the 14-inch, that Daniel has scored major successes.

The photograph below shows the North America Nebula (NGC7000) in Cygnus, taken with the 8-inch Schmidt. The bright star is Deneb. The original photograph, on colour film, shows the distinct red colour of the Nebula, and remarkable detail. ¤



The North America Nebula photographed by Daniel Cave with the 8-inch Schmidt camera

A visit to . . . Birr Castle

Recently, Antony Saunders showed us the video which he took during his visit to the remains of the "Leviathan of Parsonstown". Here, he and Catherine Saunders describe the visit.

We left Wexford at 9.30 am for the long drive to Birr Castle in County Offaly - a distance of approximately 120 miles - and passed through Kilkenny and Laios en route. A very enjoyable and scenic drive, with lots to see on the way, We stopped for lunch at Dooley's Hotel in the actual town of Birr, eventually arriving at Birr Castle at 1.30 pm, only to find it closed to visitors. What a disappointment, and that after driving all that way with four tired and somewhat irritable children on the back seat!

However, all was not lost as, on hearing that we'd come all the way from Guernsey to view the telescope, the old lady in the ticket office eventually relented and let Antony in for a half-hour peep, and to do a bit of filming with a prized but borrowed camcorder!

The story of Birr Castle astronomy is both magnificent and unique. Entirely upon his own initiative, and with no official help, the 3rd Earl of Rosse built in the grounds of the Castle a telescope more powerful than any the world had known before.

The period of telescope building at Birr Castle actually started during the lifetime of the 2nd Earl of Rosse. His eldest son, the future 3rd Earl, then Lord Oxmantown, erected a large 36-inch reflector on the lawn in front of the Castle, and we can presume that the 2nd Earl was one of those who looked through it, although it must be said that the 2nd Earl of Rosse was not an astronomer himself.

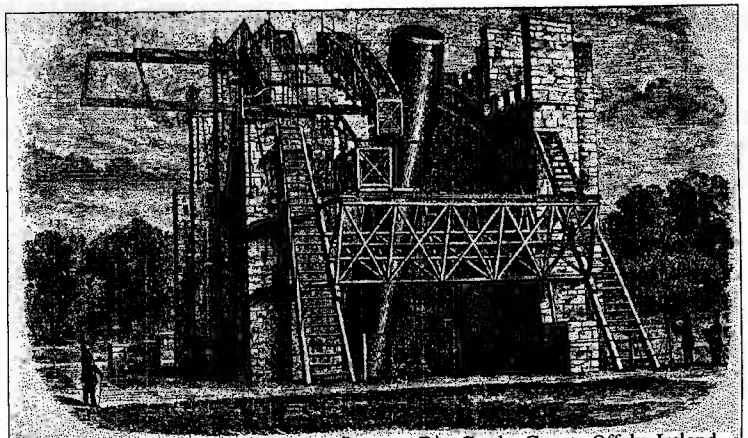
On the 13th April 1842 the huge 72-inch mirror was successfully cast. When planning the great reflector Lord Rosse knew that there were two different kinds of problem to be faced: the purely optical and the purely mechanical. His earlier success (he had already built a 36-inch telescope) had shown him the way to deal with the first, and he saw no need to alter his well tried technique on his early mirror castings.

As for the second problem, he needed a mount which would support a huge 58-foot tube. He knew that a mount which would swing this huge telescope around, as in a modern telescope, would be impracticable, so he decided to mount the 72-inch 50-foot focal length telescope between two massive (70 feet long by 50 feet high) stone walls, so that it could be turned only toward that part of the sky which lay near the meridian (the north-south line).

This meant that a star could be followed for a limited period only, e.g. for an object on the celestial equator the total viewing time was about an hour each night. His design was therefore only able to raise or lower the altitude of the telescope and rely purely on the Earth's rotation to turn the huge wooden tube.

The first trial with the 72-inch telescope started in 1845, with the discovery of the first spiral nebula, M51. In 1846 he discovered the second spiral, M99, and regular observing began in 1848. Incidentally, it is worth noting that the great telescope was never fitted with a finder.

Throughout the two decades following the completion of the 72-inch, the work at Birr went on steadily, directed personally »»



The Leviathan - the great 72-inch reflector at Birr Castle, County Offaly, Ireland

by Lord Rosse. Visitors came from all over the world to observe on all possible occasions. Lord Rosse had papers published at regular intervals, and he received many scientific honours.

In 1865 Lord Rosse's health began to fail, and after moving to Dublin Bay in the hope that the fresh sea air would do him good, he died on the 31st October 1867. Lord Oxmantown was born at the Castle on the 17th November 1840, and after the death of his father, became the 4th Earl of Rosse. His greatest contribution to science was undoubtedly his measurements of the temperature of the Moon. These experiments started in 1868, and in 1869 he had his first papers published. Also in 1869 the 72-inch reflector was fitted with a drive.

In 1877 Lord Rosse confirmed the discovery of the satellites of Mars, and in 1890 Lord Rosse concluded his work on the heat of the Moon. The turn of the century saw the last of the regular reports to the Royal Astronomical Society, and the 4th Earl of Rosse died in 1908. After his death the 72-inch reflector was dismantled, and in 1912 the huge mirror was taken to the Science Museum in South Kensington. This saw the end of astronomical observations at Birr Castle. The main mounting was taken down in 1925.

A small museum at the observatory in the Castle grounds was set up in 1971, and renovation and preservation of the tube of the 72-inch reflector was completed between 1972 and 1975.

What remains is still very impressive, and one can't help wondering if the 3rd Earl of Rosse would ever have thought that his mighty telescope would remain the largest in the world for three quarters of a century, and that it would be 122 years before a larger one would be set up in Britain (the 98-inch Isaac Newton telescope).

Birr Castle is well worth a visit if you happen to be in Ireland. The grounds are nice and the Castle is well maintained. A word of warning though - telephone first to make sure the Castle is open to visitors! ¤

Antony and Catherine Saunders

Antony and Catherine have a book on the Astronomy of Birr Castle, and some video footage, if anyone would be interested.

Double summer time - a double follow-up

In the last issue of Sagittarius I reported a follow-up to a previous article on this subject. In the September *Billet d'Etat* the States Advisory and Finance Committee reported the results of their public consultation on the question of a possible move to Central European Time (CET).

Of 75 responses, 36% were in favour of Guernsey staying in line with the UK, 24% favoured an independent move to CET, and 9% were against any move to CET. The rest (31%) had no definite opinion, although some stated technical concerns.

The main arguments for Guernsey staying in line with the UK were that businesses, particularly financial services, would suffer by being out of step with the UK, because of possible changes in working hours, loss of telephone contact time, and difficulties with business travel. There would also be problems for broadcasting (the 9 o'clock news would appear at 10 o'clock! - although it was also pointed out that television programmes unsuitable for children would be shown at a later time), and bookmakers (races run an hour late).

Some said they were against any move to CET (whether or not the UK moved), because, for example, of the possibility of more accidents to schoolchildren in the mornings, and early working for farmers.

Arguments in favour of an independent move to CET were on the grounds of benefits to tourism and recreation.

The Committee concluded that any change to Central European Time should coincide with a similar change in the UK (which is still considering it). Jersey has come to the same conclusion. ¤ ***DLC***

Asteroid observing for Hubble Space Telescope

Observations for asteroid Jokaste were tried on the 15th and 18th October. The asteroid was predicted to be magnitude 13½ - rather faint. It was impossible to identify it positively, but photographs were taken of the star field with the 14-inch telescope, so we hope that it will have been recorded.

The next observations are scheduled for the 1st to the 7th November, and will be of asteroid Elsa. This is magnitude 11, so should be a little easier, although there will be some interference from moonlight on the first few nights.

These observations are being made in support of an amateur astronomer's use of the Hubble Space Telescope. ¤ ***DLC***

Falklands star charts

Several star charts have been prepared and provided for the use of the Guernsey Press expedition to the Falklands, which takes place this December. They were interested in knowing what the sky would look like from so far south (latitude -52°) and what interesting objects might be seen.

The charts were prepared by computer, specifically for the location of the Falklands, at a convenient time in the evenings when the party will be there. Altogether, five charts were provided - for views north, east, south, west, and overhead, and were accompanied by a description of binocular objects. It is hoped that an article about what was seen will be published in a future issue.

Are you going anywhere exotic for holiday? Why not take some star charts? ¤

More Lively Limericks

Geoff Falla has come up with two limericks, far better than the meagre offering in the last newsletter! He calls the first one *The Astronomer's Lament.*

To observe all there is in the sky,
Is our aim, or at least we do try,
But cloud in the night
Often spoils our sight,
Until it all clears bye and bye.

Geoff's second contribution is called *The Pleasure of Astronomy.*

To see in the sky all the stars,
And planets like Saturn and Mars,
Is a pleasure at night,
And with the telescope's sight,
The sky is entirely ours.

We will continue to publish members' further efforts. How about some serious poetry too? ¤

The man in the street

We were strolling along the street late at night, after a pleasant meal in town, when one of our party asked, "What's that star up there?" With neither hesitation nor pause in his step, a passer-by said "Arcturus", and walked on before we could recover from our surprise.

Although the star in question was actually Vega, Arcturus was also plainly visible, and we therefore gave him the benefit of the doubt.

Hardly a scientific survey, but we can only hope that this knowledgeable "man in the street" is representative of the average Guernseyman! ¤ ***DLC***

Did you know . . .

That there are over 1000 deep sky objects visible with binoculars?

They are listed in *Touring the Universe through Binoculars* by Philip Harrington.¤

A Fleeting Visitor

Mark Humphrys made a fleeting visit for a few days in October. He stopped by while his ship was being moved from the South China Seas (remember his article on binocular objects in the last newsletter) to Egypt. He brought with him the article on radio astronomy which appears in this issue. We hope to hear of his experiences - astronomical and otherwise - from his new latitude and longitude. ¤

Shakespeare's astronomy

Recently, I saw King Lear performed at Stratford. In Act I, Scene II, in response to Gloucester's "These late eclipses in the sun and moon portend no good to us", Edmund says:-

"This is the excellent foppery of the world! that, when we are sick in fortune, we make guilty of our disasters the sun, the moon and stars: as if we were villains on necessity; fools by heavenly compulsion; knaves, thieves, and treachers, by spherical predominance; drunkards, liars and adulterers, by an enforced obedience of planetary influence." And cynically: *"my nativity was under ursa major; so that it follows, I am rough and lecherous."*

What was Shakespeare's view of astrology and astronomy? He has many references to both in his works. Here's an interesting area of research for someone. ¤ ***DLC***