Advertisements

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

60 mm astronomical refractor telescope on altazimuth mount and tripod. Includes 14mm and 6 mm eyepieces. £35.00.

Call John Taylor, tel. 47665.

FAS Newsletter . . .

The Spring issue of the Newsletter of the Federation of Astronomical Societies is now available to members free of charge. Copies may be picked up at the Observatory. It again contains news of our activities, and especially Sagittarius.

. . . Popular Astronomy

The April 1994 issue of *Popular Astronomy*, the magazine of the Society for Popular Astronomy (formerly the Junior Astronomical Society) contains an article entitled *Britain's Island Societies*. This features the Vectis Society on the Isle of Wight, and the Astronomy Section of La Société Guernesiaise (erroneously called the Astronomical Society of Guernsey). It gives a little bit about our history, facilities and activities.

Light pollution

Members will have seen (and heard) the excellent coverage given by the Press and radio to Ken Staples's publicity on light pollution. A good start, Ken!

Astronomy Section Officers

Section Secretary:	Geoff Falla	724101
Honorary Treasurer:	Peter Langford	720649
Light Pollution Officer:	Ken Staples	54759

The next newsletter will be published early in September. The deadline for publication materials is 15th August.

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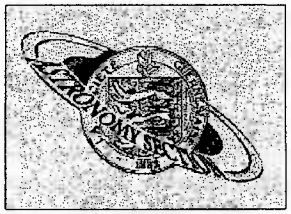
Sagittarius

The Newsletter of the Astronomy Section of La Société Guernesiaise



July/August 1994

Forthcoming events

The Hubble Space Telescope
Tuesday, 19th July
by Daniel Cave
8.00 pm at the Observatory

Comet Shoemaker-Levy collides with Jupiter
16th to 21st July

Annual clean-up day
Saturday, 6th August
9.00 am at the Observatory

Barbecue and Perseid Meteor Shower
Thursday, 11th August
7.30 pm at the Observatory

On page 6 Michael Maunder catches the eclipse in the palm of his hand!

Inside

Major articles in **bold**

Centre inserts

Cygnus - The Northern Cross
July/August star chart

Hubble Space Telescope

At 8.00 pm on Tuesday, 19th July, at the Observatory, Daniel Cave will talk on the Hubble Space Telescope. As readers of Sagittarius will know, Daniel has been following the progress of the HST very closely, and will no doubt have the most up-to-date information for us.

Annual clean-up day

On Saturday, 6th August, starting at 9.00 am at the Observatory we will hold our annual clean-up day. This is a chance for everyone to shine - literally! Last year only four members turned up, so let's have a better turn-out this year. There are plenty of jobs, including painting and cleaning. It will last all day, so bring a sandwich for lunch, or come just for a while in the morning or afternoon.

Barbecue and Perseid Meteor Shower

The annual barbecue will be held **on Thursday, 11th August at 7.30 pm** at the Observatory. As usual bring your own victuals. The barbecue fires will be provided, but you need your own food and drink, although dishes to share will be most welcome. There is no charge.

Following the barbecue there will be the meteor count. Should it be cloudy we will probably go ahead with the barbecue, but postpone the count until the next day. If it is raining then the barbecue will be postponed. Call Geoff Falla if in doubt.

Last year's barbecue was a very enjoyable time, and lots of meteors were observed. Do come along to this year's event.

Comet Shoemaker-Levy collides with Jupiter

From the 16th to the 21st July about 20 pieces of Comet Shoemaker-Levy (SL-9) will collide with Jupiter. This unique event is causing much excitement amongst astronomers, and there is considerable speculation as to what visible effect there may be on the planet. The impacts take place on the far side of the disc, but Jupiter's rapid spin will bring the site into the field of view within half an hour.

Daniel Cave reports the following predicted collision times when Jupiter is above our horizon:-

1994 July 16	19h ±40m
1994 July 17	15h ±40m
1994 July 18	19h ±40m
1994 July 19	**21h ±40m**
1994 July 20	15h ±40m
1994 July 21	15h ±40m
1994 July 21	18h ±40m
1994 July 21	**21h ±40m**

All times are in UT; add one hour for BST. July 19 and July 21 at 21h should be the best times to observe; it will be after dark, and there may be reflections from Jupiter's moons. Note the uncertainty in the times. *Sky and Telescope* gives 21:55UT on July 19, and 21:43UT on July 21.

See photograph of the comet on page 19.

Lunar eclipse eclipsed!

The lunar eclipse on the morning of May 25 was itself eclipsed by cloud. In fact, the weather was dreadful. At least that relieved us from staying up for what was, after all, only a very slight partial eclipse.

The microwave background radiation

On April 26 thirteen members heard Antony Saunders talk on the microwave background radiation in the universe. He started by comparing the appearance of the universe in wavelengths other than the visible. In ultra-violet radiation the Moon would barely be seen, but some stars would appear where no stars were visible before. In X-rays there would be no Moon and few other sources. Gamma rays would reveal flashes of light, while in infra-red cold bodies would be seen. However, at microwave wavelengths the whole sky would be "bright", as microwaves account for 99% of all radiation in the universe.

Antony then described the history of background radiation studies, especially from the 1960s onwards. This included: the Penzias/Wilson Bell Labs antenna (they couldn't get rid of an annoying hiss, which turned out to be the echo of the Big Bang), rockets and balloons in the 1970s, and the COBE satellite launched in 1989. The latter caused a sensation in 1992 with the release of the famous "picture" of the universe as it was just 300,000 years after the Big Bang.

Antony concluded his talk by quoting from the book *The Afterglow of Creation*, and this stimulated many questions and speculation about the possible fate of the universe.

Book sale

13 books donated by members were sold on June 21, raising £56 for Astronomy Section funds. Many thanks to all who gave and purchased them. There are still a few books left, so come and buy!

Twinkle twinkle

Scintillate scintillate global flavivic,
Fain have I fathomed thy nature specific,
Loftily poised in the ether capacious,
Strongly resembling a gem carbonaceous.

David Williams revealed all - about the stars, at the meeting held on the 24th May. His talk led us from the birth of an average star, to its stable life and rapid death through the Red Giant, White Dwarf and Black Dwarf stages, and the rather more dramatic life and death of more massive stars, leading to the Neutron stars. He contrasted what the ancients knew about the stars - very little - with what we now know. He described a star's anatomy, and the Harvard system of classifying stars by their temperature and colour. The life of a star was demonstrated in terms of the human life-span, and he pointed out that if stars were the size of pinheads they would be typically 20-30 miles apart.

David concluded a fascinating talk by discussing the balance of nature, as exemplified by our own Sun and the position of the Earth which favoured the creation of life. His talk was much appreciated by those present, and stimulated a good discussion.

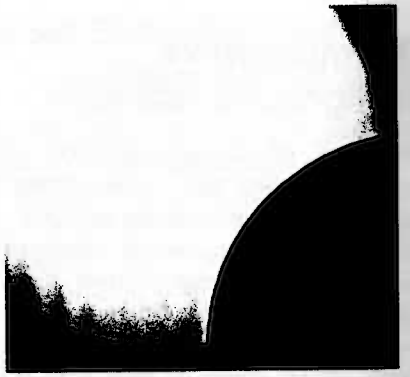
The Sun

On June 21 Lawrence Guilbert gave us a comprehensive talk about an ordinary yellow star - our Sun. A full account will be given in a future issue of Sagittarius. In the meantime, did you know that the Sun accounts for 99.87% of the mass of the solar system, leaving just 0.13% for all the other objects? The interest generated by his talk owed much to Lawrence's enthusiasm: "The uncertainty of observing sunspots adds greatly to its fascination".

Solar eclipse observed

About 15 members and guests gathered at the Observatory on May 10 to watch the best partial eclipse of the Sun for 20 years. Although there was some cloud, the eclipse was well observed with the 11-inch telescope (equipped with a special filter), image projection with binoculars, and the solar eclipse glasses from America.

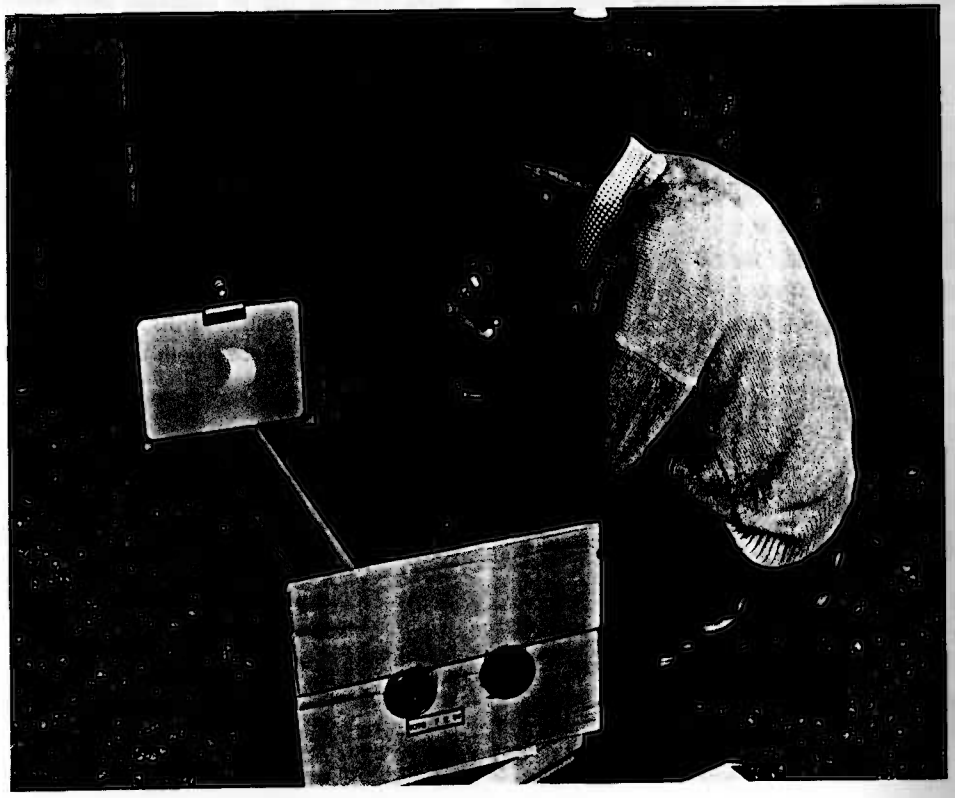
The glasses provided by Specsavers proved very popular with the 2000 school-children who received them. There was excellent publicity in all the media, and thousands of Islanders took the opportunity to see the eclipse in safety. The event netted the Astronomy Section no less than £1000, which will go a long way towards a CCD imaging system. We are most grateful to Channel Printers and Specsavers for their excellent support.



The onset of the eclipse, above, was photographed by David Le Conte with the 11-inch telescope.

On the next page Michael Maunder writes about photographing the eclipse from Arizona, and catches it in the palm of his hand!

Below, Roger Chandler uses his binocular projection device to view it safely.



The Arizona Eclipse

After the last two eclipse trips failed due to weather, I was determined that this one was going to succeed. Finland was unlikely, anyway, at around 3 degrees altitude, but Hawaii should have been OK except for the Pinatubo volcano. On both occasions the really annoying bit was that we would have seen it had we stayed in the hotel !

I went with Dr Peter Cattermole who runs *Journeys of Special Scientific Interest* from his Sheffield base. As an astronomer, and a geologist, he is highly suited for the job, with a vested interest in seeing it himself.

Just before we were due to leave, Patrick Moore found he was able to join at the last minute in a new capacity. It seems this was his first trip where he could just be on holiday, not taking an active part in the organisation. There was some doubt because his eye operation last year was still causing some bother. Fortunately, all was well in the end.

An advantage of travelling in a small group of 20 is the scheduled flights. Anyone used to huge numbers on a package deal will know what that means. After a relaxing stopover in Minneapolis, the group found itself in Tucson latish on Sunday with the eclipse early Tuesday. Always a good idea to get it over early so that the equipment does not need lugging around for days, with more risk of damage, and afterwards can be a simple holiday.

David Le Conte gave me some advice on getting to Mt Hopkins, but in the event it was not to be as the roads were impassable. However, Monday was scheduled for Kitt Peak. It turned out to be superb with fine weather, gradually turning cloudy, with a poor forecast. Oh, no, not again, was the cry. That evening we were a bit down, although a pleasant meal with Don Trombino lifted us a bit. He is a solar eclipse chaser like ourselves, and noted author, deciding to chance it in central Tucson as "it is not a total". Another bad sign.

Lift off at 3 am Tuesday morning. Cloudy, of course. The local drivers were ladies and quite unused to such a group of enthusiasts, with all that gear. Shortly after dawn we had reached Douglas, a small town, then it was dirt track, the Geronimo Trail, through the desert. Every so often we saw other enthusiasts getting ready off the track; then after about half an hour, there was sign of much road activity across our front. That was the main highway over the border in Mexico, and time to stop. The site was perfect, with crystal clear skies.

Within minutes everyone had selected their own plot and set up equipment with plenty of time to spare for first contact.

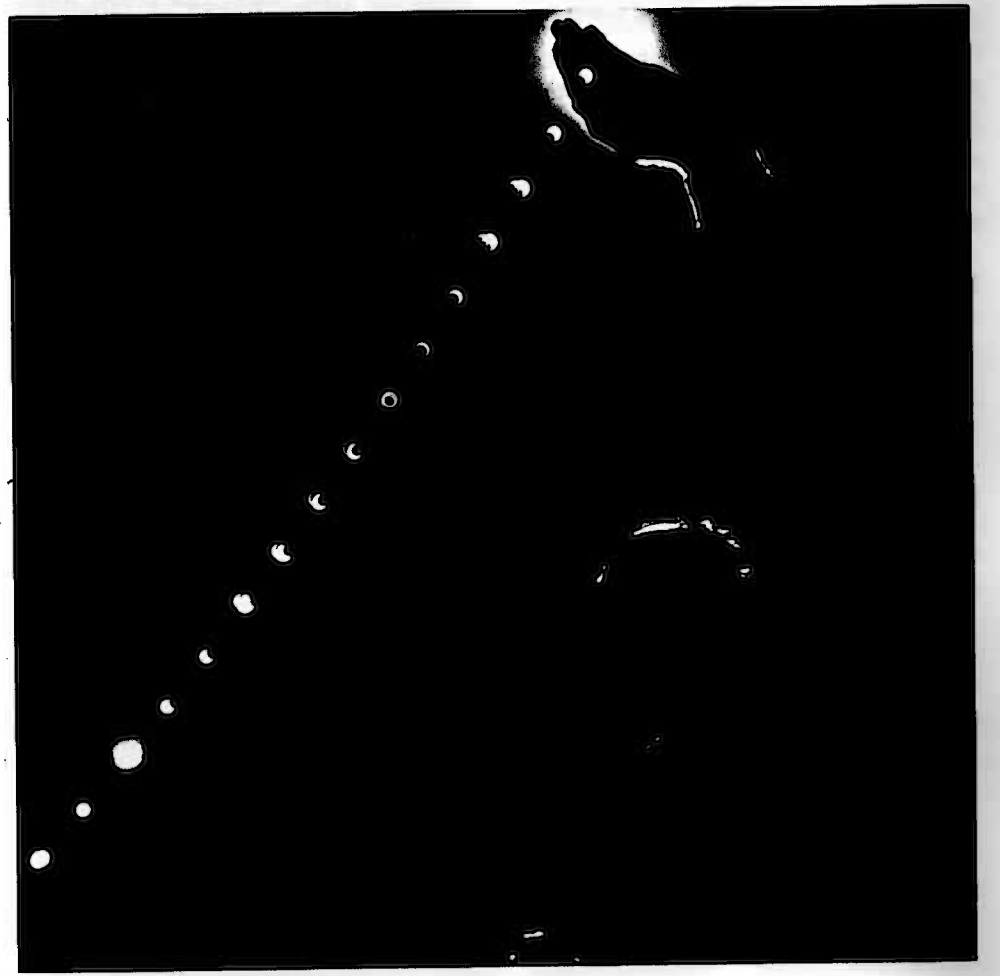
My own equipment was very simple, and duplicated. I had found out by hard experience that cameras do fail and the human error factor is even more important. Rather than trying to bracket exposures, and then leaving the settings wrong for the next one, it is much safer to practice over and over again at home and set the main camera at a fixed exposure based on that experience. With an annular, this is relatively easy. The backup is set at a different exposure, and the film latitude does the rest.

The main pair were 500mm f8 mirror lenses (f16 in fact, so much for adverts, and confirming the need for many practice runs). Each was fitted with inconel »»

ND filters, bought many years ago, but a 000 brush and matt black paint works wonders with a steady hand with any pinholes found. A x2 doubler is ideal for solar work as it allows enough 'space' for tracking errors in 35mm. Each lens was fitted to a Canon T-70, with one on the main part of a portable equatorial motor drive, the other fitted instead of the counterweight. Very logical as it balances perfectly and saves all that excess luggage. A crude alignment with a compass, and tracking accuracy was super for the short exposures needed and only small corrections needed every 20 minutes or so to centre again. You guessed it, one camera did not wind on, the other was fine.

The secondary experiment was a bit of a gamble, which turned out to be the real gem on the day. A Saros ago, I had 2 Lubitels, working in afocal mode to give a 1200mm telephoto effect.. This time the Canons were a better bet, so the Lubitels were used in multiple exposure mode to catch as much of the sequence as possible. The whole 3 hours would not go on the 6x6 cm film, which is quite a problem.

Experience, again. Get as much in the »»



can as soon as possible because the non-astronomers are always itchy to get away as soon as the main part is ended, never mind those trying for the whole lot. So, how to stop the sequence and make a nice picture ?

Unlike a total eclipse, you cannot take the ND filter off, and take pretty pictures with trees or natural objects in the background. There just aren't any in a desert. My answer was to make a self portrait. When the final image of the 10 minute interval sequence was reaching the film edge, I just stood in front of the camera, shielding the lens with my palm.

Although very simple in concept it took a great deal of planning to get right. First you have to know which way the solar sequence curves across the film, then you have to hold your hand up with your arm making a complementary curve. Whilst practising, you get some very funny looks! All this with a laterally inverted image in the twin lens reflex camera. It needed my wife Wendy's help to get the feet position right. Then try it out a few times to see how your hand shadow lies across both camera lenses, mounted side by side.

Each Lubitel is a doddle for multiple exposure, and a pneumatic release ensures no vibration. A simple 'Y' junction and the two are in perfect synchronisation from a single bulb, with as long a stretch as you need. For the final exposure, all that was needed was to remove the inconel filter and take the final exposure. That is not so easy to judge, but as I was already using f16, a stop or two under-exposure ensured a nice silhouette of myself and a nice deep blue sky. The film in one camera was Velvia slide, which I knew had the necessary fine grain and contrast. The other had Ektar 25 for the same reason for prints. Yes, that failed because the pneumatic release stuck and jammed the shutter. The pictures are certainly different but US for publication.

The slide of myself in front of the camera appearing to catch or stop an eclipse is a new idea, and made even more artistic with the sun's halo round the hand. Luck always plays a part in this as reflections off my bald head were something I had not thought about, and make the picture balance even better. Normally I wear a hat in the sun, and that would have not been anywhere near as effective.

During the partial phases, some very nice examples of crescents were spotted under the small acacia bushes. Unlike normal trees, these feathery leaved branches give just the right pinhole effects, and much film was used recording crescents and rings. Peter Cattermole really got the idea, and pressed his straw hat into service, or stood with his arms just folded. That was acceptable, but much hilarity was had when he picked up a dried cowpat, punched a hole in that and used it as another way of showing the pinhole effect on the ground.

The skies stayed absolutely cloudless throughout, although we saw much cloud to the North, over Tucson. When we got back, it had been raining and the eclipse was only seen through cloud gaps. My luck had changed and I would not have seen the event, partial only, from the hotel.

The rest of the holiday was equally great. Flight in a small aircraft over Meteor Crater, Sagittarius star clouds due South all night from the hotel balcony in Strawberry, a kilometer down in Grand Canyon, and etc. More on that some other time. ¤ ***Michael Maunder***

Past, present and future imaging instruments on the Hubble Space Telescope

by Daniel Cave

A telescope in space presents a unique opportunity to obtain extremely high resolution astronomical images. Free of the absorption and distortion of the Earth's atmosphere, the resolution of the telescope becomes limited only by the quality of the instrument and the wave nature of light.

The Hubble Space Telescope (HST) was launched in 1990, equipped with two instruments capable of imaging - the Wide Field and Planetary Camera (WF/PC) and the Faint Object Camera (FOC). It was with these instruments that the telescope's spherical aberration was discovered and characterised.

First Light

The WF/PC is located in the only radial bay available to a scientific instrument. Light from HST's Optical Telescope Assembly (OTA) is diverted with a pick-off mirror from the OTA's optical axis into the instrument. It is on the optical axis that the best image quality should be found, and the WF/PC was designed to make good use of it.

The wide field camera takes the OTA's f/24 beam and converts it to f/12.9 by using four re-imaging telescopes. At this focal ratio and with its four detectors this camera views a region of sky 2.57 x 2.57 arc-minutes square. Each CCD pixel corresponds to 0.1 arc-seconds of sky. The OTA was designed to be capable of a resolution about twice as good as this, but this would have lead to a more restricted field of view, which is unsuitable for the study of galaxies and clusters of galaxies.

The Faint Object Camera (FOC) is a photon counting device designed to exploit fully the spatial resolution of the OTA. It uses an image-intensifying device as its detector. It was designed to look for, among other things, massive black holes in globular clusters, planets around nearby stars, and to study gravitational lenses. The camera is one of the axial instruments, and like WF/PC it was designed to operate in two modes - f/48 and f/96. When used at f/96 the camera views an area of sky 11 arc-seconds square with a pixel size of 0.022 arc-seconds. At f/48 the camera sees a 22 arc-second square with pixels of 0.044 arc-seconds. The FOC also has a "super high" resolution mode, which was designed to operate at f/288, giving a pixel size of 0.007 arc-seconds.

As the primary mirror of HST suffers from severe spherical aberration, the performance of both these original instruments was greatly reduced; some of the modes of operation were not possible. A good way of assessing how well an optical system performs is by looking at how much of a point source's total energy is concentrated within a given radius in the image. For the OTA as a whole, the percentage of light falling within the central 0.1 arc-seconds radius is reduced by a factor of 5. The WF/PC was designed to concentrate 70% of a point source's energy within a 0.1 arc-second radius, but only 12% of the light actually got »»

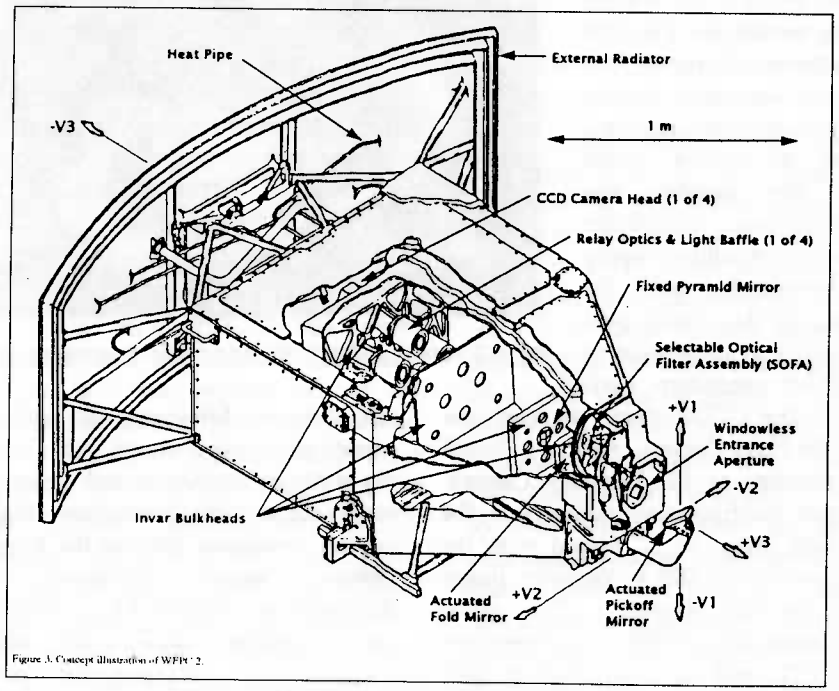


Figure 1. Concept illustration of WFPC2.

there. The remaining light was spread into a halo several arc-seconds in radius. Observations of faint objects, or objects in crowded fields were most severely degraded by the aberration.

Not content to wait for modified instruments with the ability to correct the spherical aberration, astronomers tried to find a solution. While they were unable to find a complete solution, they were able to improve HST images using computer processing. Complex algorithms were derived to sharpen the images. An unprocessed stellar image taken with HST would show a bright condensation surrounded by a diffuse halo. By mathematically describing the shape of the flawed image produced, and by knowing what the star image should look like, the process can be inverted. This creates a sharpened version of the blurred image. This process, known as deconvolution, works better on some objects than others - it works best on bright point sources such as stars or star clusters, but it improves virtually all other images as well.

Second Light

After the discovery of the OTA spherical aberration, attempts were made to characterise the fault. This was made easier by the discovery that the reflective null corrector was incorrectly set up, and this error could fully account for the observed manufacturing error. It was soon realised by scientists who were already building a backup WF/PC, known as WFPC 2, that small changes to its optics would allow the aberration to be corrected in this instrument. »»

It was decided in August 1991 to reduce the scope of the instrument to enable it to align itself accurately, and for it to be completed on time. Instead of having eight CCDs, the number was reduced to four. The ability to switch between two modes was removed, and the focusing of the camera was left entirely to movement of the OTA's secondary mirror.

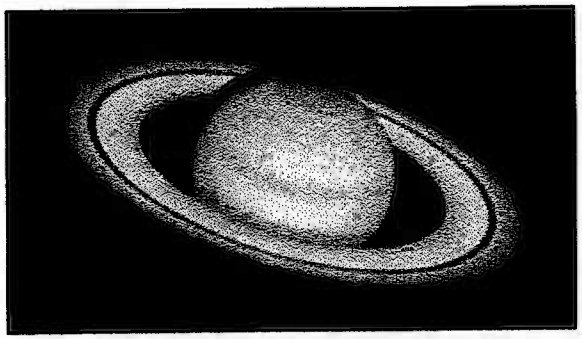


Figure 2. Saturn with the WF/PC and extensive computer processing.

Three of the CCDs operate as what was the Wide Field Camera, while the fourth CCD operates as the Planetary Camera. This new configuration means that the wide field image is 'L' shaped with the higher resolution f/28.3 planetary image placed in the corner. The initial specifications for WF/PC have been met by WFPC2, and in some respects they have exceeded those of the original camera; for example, WFPC2 is more sensitive in the ultraviolet than WF/PC. Advances in detector technology have made this possible.

All these modifications did nothing to restore the capabilities of FOC, however. To solve its problems, and those of the remaining scientific instruments, engineers at Ball Aerospace devised the Corrective Optics Space Telescope Axial Replacement (COSTAR). COSTAR's clever design allows the spherical aberration to be corrected for the remaining instruments, including FOC. By deploying arms fitted with corrective mirrors in front of each instrument, the spherical aberration can be removed. There are some side effects from using COSTAR. Firstly the corrective optics increases the focal length of the telescope, this means that the fields of view of the instruments are reduced. Secondly, as the light has to go through two extra reflections (two mirrors are used to correct each instrument) some light is lost; this means longer exposures are needed.

	WF/PC	WFPC2
'Wide field" focal ratio	f/12.9	f/12.9
'Wide field' pixel size	0.1"	0.1"
'Wide field' field of view	2.57' x 2.57'	2.5' x 2.5' 'L' shaped
'Planetary' focal ratio	f/30	f/28.3
'Planetary' pixel size	0.043"	0.046"
'Planetary' field of view	66" x 66"	35" x 35"
Peak CCD efficiency	~ 50%	~ 40%
Operating temperature	- 87°C	- 70°C

Table 1. Comparison between WF/PC and WFPC 2.

COSTAR greatly improves the image quality obtained by FOC. The combination means that FOC's performance is very nearly that of its original specifications (except for the side effects noted above and the fact that the f/288 channel is unusable).

Third Light

Hopefully, in early 1997, the Space Shuttle will again return to HST. On this service mission, as well as general maintenance, the crew will also replace two of the scientific instruments. HST will lose two axial instruments, the Goddard High Resolution Spectrograph (GHRS) and the Faint Object Spectrograph (FOS). Replacing these will be the Space Telescope Imaging Spectrograph (STIS) and the Near-Infrared Camera and Multi-Object Spectrometer (NICMOS). These two instruments are currently in the final stages of design. For NICMOS large infrared CCD arrays are currently being tested. NICMOS will extend the telescope's wavelength coverage, as well as bring up-to-date technology to the Space Telescope. Changes to these two instruments are currently being made to accommodate the OTA spherical aberration, as well as funding and time constraints. Between now and installation, NICMOS may well lose its multi-object spectroscopy capability, leaving just the near infrared camera.

Beyond 1997, HST's future is even less certain. A third and probably final servicing mission to HST may take place in 1999. The main task of this mission will be to install an instrument currently known as the Advanced Camera. The capabilities of the camera are currently undecided. The camera may well use a large format CCD as its primary detector to deliver diffraction limited images over a large area of sky (several arc-minutes).

Discussions as to whether the camera should replace WFPC2 or one of the axial instruments are now taking place. Originally it was thought that as the Advanced Camera was basically an improved WFPC2 then it would replace WFPC2 in the radial position. This would allow it to obtain the best image quality delivered by the OTA while upgrading the telescope's imaging ability. There are, however, a number of reasons why this may not be such a good idea. If each HST instrument has an equal chance of failing by 1999, then, as there are four axial instruments and one radial instrument, it is more likely for one of the axial instruments to have failed. There is a good chance that come 1999 WFPC2 will still be functioning well after five years in orbit, while one of the axial instruments could have failed. For example, the FOC, which has already been suffering from problems, will be coming up for its 10th year in orbit.

So it may be better to design an axial Advanced Camera. An axial instrument also has more space available for the design, and with fears that the Fine Guidance Sensors may not be reliable by 1999, incorporating a new guidance system into the camera could be possible. It has also been suggested that a refurbished High Speed Photometer (HSP), including corrective optics, should be re-readied for flight. If the FOC has failed and is replaced by the Advanced Camera, then it will mean that COSTAR is redundant, which could allow the HSP to take its place. All these changes would lead to a final configuration containing »»

WFPC2, the Advanced Camera, STIS, HSP and NICMOS.

The recent service mission has clearly shown the serviceability of the telescope. The new scientific instruments have all checked out and are beginning to make science observations. The success means that the long term future of the project is safer - the second and third generation instruments look more likely to make it into orbit. It may be a few years later than planned but today astronomers are able to take full advantage of a space observatory. ¤

Daniel Cave

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Figure 1. STScI WFPC2 Instrument Handbook, page 8.

Figure 2. NASA Spacelink.

Time travel and the speed of light

Time travel, both into the future and into the past is now being considered as a theoretical possibility, with debate on the effects created by "black holes" and more recently "worm holes". We are told, however, that it is not possible to exceed the speed of light, which travels at 186,000 miles per second. Moonlight reaches Earth in just over one second, while light from the Sun arrives in a few minutes.

Remarkable effects have been claimed in the relationship between speed, gravity and time. As the speed of travel of an object increases time slows down, while at the speed of light time stands still. The slowing of time was confirmed in a remarkable experiment at the CERN Particle Physics Laboratory in Switzerland. Short-lived, subatomic particles were accelerated to very high speeds, with the result that the lifetime of each particle was extended by some thirty times.

Time is not only affected, it seems, by speed. Gravity also affects time. The gravity of Earth slows time by around one part in a million, or one ten-thousandth part of one percent. An infinitesimal amount, but time in space is speeded up by that fractional percentage. The effect was first claimed by Einstein in 1907, and was proved correct in 1977 when a highly accurate atomic clock was placed on a rocket flight into space.

We are told that because of the speed of travel for an astronaut who completes a journey to the Moon, time will slow down very slightly, so that on returning he will have aged less than a companion remaining on Earth. The astronaut will have moved slightly into the future. While measured distance is fixed, the passing of time seems variable according to speed of travel and gravity.

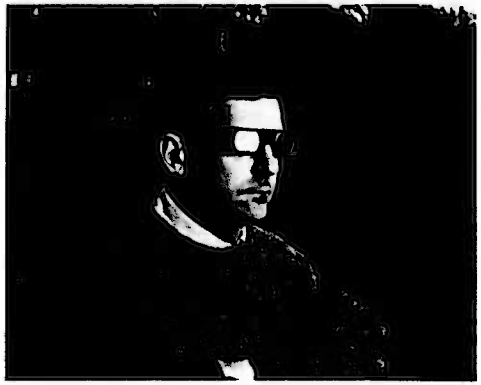
Let us suppose now that an astronaut sets out on a hypothetical journey to one of the nearer stars, at a distance of ten light-years. The spacecraft accelerates to a speed nearing that of light, and time slows down by a modest amount, to the extent that when our astronaut reaches the vicinity of the star only five years have passed, according to his own measurement of time. Returning to Earth at a similar speed he again arrives five years later, having aged ten years during the journey. His companions on Earth, however, will be a full twenty years older than when the astronaut departed.

We can now pose the question: What was the speed of the astronaut during the journey? To those who remained on Earth the astronaut's speed of travel appeared to be that of the speed of light, or nearly so. The star is ten light-years away, so that a return journey at near light speed could not be achieved in less than twenty years. Yet our astronaut has aged only ten years. He will claim to have exceeded the speed of light according to his own experience and reckoning of time, and would be able to make a return journey to a star much further away during his own lifetime. Is our astronaut mistaken, or can the speed of light be exceeded because of time dilation effects during such a journey?

If time can be stretched, then, like Parkinson's Law, distance travelled can be extended to fill the time available. It seems possible that only the limits of technology will prevent astronauts of the future from achieving the seemingly impossible. ¤ ***Geoff Falla***

Potted portrait - David Williams

Our new series of brief portraits of Astronomy Section members is led off by David, who, sadly, is leaving Guernsey in July and moving to Ipswich.



David Williams observing the recent solar eclipse.

I became interested in astronomy in a roundabout way. I had been given a toy telescope as a ten-year-old - I remember it quite distinctly and I wanted to know how it worked. At about the same time (1962-63) both America and the Soviet Union were putting people up into space, and I well remember reading about their exploits in the newspaper. My interest in space and space flight had been whetted!

Matters developed rapidly from there. I borrowed a book from the mobile County Library van every two weeks, and devoured the contents. By the age of 14 my parents had bought me a Charles Frank 4-inch Newtonian for Christmas, and I was well set on becoming the village loony, the only teenager to spend his free time looking up at the stars. I became very popular in 1969, but sadly a great many people were disappointed, after queueing in my parents' garden in July 1969, that they could not see the men on the Moon!

My interest in science took a more professional turn when I qualified as a science/maths teacher, and indeed have spent much of my career teaching science.

During my college days I wrote articles for the College magazine and was the astronomy correspondent.

The highlight of my journalistic career was the non-appearance of Comet Kahoutek in 1974. I had to publish a public apology for that in the January issue of the magazine!

Since coming to Guernsey I have gradually played a more active part in the Astronomy Section's activities, until today I rejoice in the title of Education Officer, and I must admit I do enjoy the open evenings and school visits. Give me an audience and I'm away.

I'm a general observer with no particular skills in any one field. I have a good general knowledge without being a solar Lawrence Guilbert, a double star Geoff Falla, or a Frank Dowding planetary man, and as far as DIY is concerned then John Taylor and Rex Huddle will knock me into a cocked hat any time!

No, I feel my strength is talking to people and trying to get them interested in a subject I love dearly. If I can do that and see some of the wonders of the night sky at the same time, then I'm happy.

Thank you all for your friendship over the years. I've enjoyed myself enormously. May you continue to grow in strength and numbers. I will certainly keep in touch. As a hero of mine would say, "Live long and prosper!"

David Williams

David describes the Orwell Astronomical Society, Ipswich on the next page.

Orwell Astronomical Society, Ipswich

As many of you will know, I am leaving Guernsey during the summer to enable me to take up a new appointment as Headmaster of Ipswich Preparatory School in September.

Recently, I wrote to the Ipswich Society requesting details, and amongst the literature they sent was a potted history of the Orwell Park Observatory, which I reproduce below by kind permission of the Society's Secretary, Mr. R. Gooding.

Orwell Park Observatory

The observatory was built in 1872 by the owner of Orwell Park Mansion, Colonel Tomline. Tomline was a very wealthy man, having inherited three other estates as well as the 20,000 acres around Orwell Park. He built the Ipswich to Felixstowe railway line and started Felixstowe Dock. For several years Tomline held a Parliamentary seat.

One of Tomline's hobbies was astronomy, and as money was no object the observatory was added on to the end of the mansion. The telescope and observatory were designed by Wilfred Airy. The telescope was built by one of the world's leading telescope makers, Troughton and Sims of London. The lens was ground in Germany by Merz. The complete telescope cost £1,678 19s 4d. No record has been found of the cost of the tower, but it must have been considerable. Tomline installed a lift up to the observatory for his exclusive use. Tomline employed a professional astronomer to run the observatory, John Plummer, who had previously worked at Durham University Observatory. He lived in the village in a house, still standing today, called "Orwell Dene". Plummer made numerous observations with the telescope for the following 18 years. His observations were published in the Monthly Notices of the Royal Astronomical Society, copies of which are still kept at Burlington House in London. The last report appeared in November 1890.

After Tomline's death in 1889 Plummer remained for another year only, as the new owners of Orwell Park (the Pretyman family) had no intention of maintaining the observatory. The observatory was left virtually dormant for about forty years until a Mr. Collinson began observations in 1930 and continued for about six years. The Pretymans at one stage decided to sell the telescope, but without success. It was offered to Eton College, but they declined.

During the Second World War the Army moved into the Mansion and used the observatory as a post for observing enemy aircraft. During this period many items were either lost or stolen from the observatory, including the sidereal clock. The fabric of the observatory also deteriorated badly.

In 1948 The Ipswich and District Astronomical Society was formed, and the telescope was used up to 1958 when they disbanded. Between 1958 and 1967 the observatory fell into disuse again. Our present society, The Orwell Astronomical Society (Ipswich) was formed in 1967, since when the telescope has been repaired and the observatory restored.

It all sounds rather fascinating, and Mr. Gooding tells me that the Society refurbished the instrument (a ten-inch refractor) and observatory. Orwell Park School retains ownership, but lends the observatory to the Society.

I shall be continuing my membership of La Société, and so become an overseas member of the Section. ¤

David Williams

Education Officer wanted

With David's departure we need a new Education Officer. Are **you** willing to help?

Famous lives - 3
Tycho Brahe (1546-1601)

As a boy the one thing I knew with any certainty about Tycho Brahe was the fact that he had a false nose made of gold! I have since discovered that he is remembered not simply for his nose, but for his pioneering work in observational astronomy and the data he collected, which was eventually to form the basis on which his assistant, Kepler, was to formulate his famous planetary laws.

The observations made by Tycho were the most accurate of his day. When one considers that he had no sophisticated equipment (not even a telescope, as Galileo was not to invent his until 1609), then one can only marvel at his precision, his attention to detail and sheer genius.

> It is reported that the duel in which Tycho lost his nose was fought during a sumptuous dinner when an argument broke out and the protagonists went outside to fight. Unfortunately, it was dark at the time, and sword-fighting in the dark seems bound to produce unfortunate results, especially when the duellists are a little the worse for drink!

Tycho was born into a privileged life. His father was a Privy Councillor at the Court of the Danish King, and a local Governor. However, his uncle, another wealthy nobleman, kidnapped the infant Tycho and raised him as his own son!

In later life Tycho was to study law at the University of Copenhagen, where we are told his interest in astronomy was first kindled by observing a total eclipse of the Sun in 1560, August 21st. This was followed by three years studying at the University of Leipzig, where he made his first observations, a conjunction of Saturn and Jupiter. It was also here that he discovered that the almanacs in use at the time were totally inaccurate, up to several days. As a result, the 20-year-old Tycho determined to devote his life to gathering accurate planetary and stellar data so as to revise the almanac tables.

> Tycho Brahe kept a pet dwarf, who was apparently mentally deficient, and allegedly possessed spiritualistic and telepathic powers. His name was Lep, and he held great sway over Tycho. The great man always invited him to his banquets, and on occasions even fed him!

His reputation as an astronomer was secured in 1572, when, on November 11th he saw from his observatory on his estate in Scania, a new star, brighter than the planet Venus. The supernova he had observed was to be found in the constellation of Cassiopeia. This was a most significant discovery, as: (a) Tycho argued that no star was supposed to be there; (b) by careful observation he showed that it lay beyond the Moon and therefore in the stellar region; and (c) this threw a great many scholars into disquiet, as it called into question their own teachings and beliefs.

In 1573 Tycho published his observations of the new star in the book *De Nova Stella.* His reputation was now assured, and the nova has come down through history as Tycho's star. »»

His new found fame was to take him to the island of Hven, where, under the patronage of King Frederick II of Denmark he established his famous observatory in 1576. The observatory was called Uraniborg, after Urania. Over the next 20 years or so Hven was to become the centre of astronomical excellence, where Tycho conducted most of his famous planetary and stellar observations and calculations. His fame grew and spread throughout Europe. As a result his island home was constantly in demand by visiting scholars and teachers.

> Tycho's famous observatory, Uraniborg, consisted of four observatories, a castle and splendid gardens. It has been described as a self-contained city. It even had its own prison!

However, his work was also to place him at odds with many people, especially the Church and the new King Christian IV. Sadly, in 1597 Tycho left Hven for good, and settled in 1599 in Prague. This was to prove a fortuitous move, as it enabled a young mathematician and astronomer by the name of Kepler to visit the grand old man of astronomy and discuss new ideas he had about the planets and the way they moved through space.

Tycho accomplished much during his lifetime. His observations of the nova in Cassiopeia, his study of the solar system, his observations and calculations of the positions of over 200 stars, and his proof that the comet of 1577 lay farther than the Moon - all carried out with primitive apparatus and no telescope - show that he was without doubt one of the greatest observational astronomers of any age. We must also remember that his work was to inspire the epoch making work of Kepler, who was his assistant for the last three years of his life.

Tycho Brahe, nobleman, who lost his nose in a duel, inspired by the beauty of a total solar eclipse, is remembered today as a brilliant observational astronomer.

¤ ***David Williams***

References:-

Encylopædia Britannica
Penguin Dictionary of Astronomy
Kepler's Planetary Motion

Do you know? (Answers by David Williams & Daniel Cave below)

Q1. What was the name of the Pope who banned Galileo's work in 1633?

Q2. What is the definition of 'astronomical twilight'.

Q3. If a first-quarter moon is due south on the equinox, what time is it?

Q4. What was the last spacecraft to visit Jupiter?

Q5. Currently the world's largest telescope is the W.M. Keck telescope. Who was Keck?

Answers to Do you know?

A1. Pope Paul V.

A2. It ends (or begins) when the Sun is 18° below the horizon.

A3. 6pm

A4. Ulysses

A5. Keck was a wealthy oil company founder. Money for the telescope was donated by the Keck foundation.

101 years of lunar eclipses

In the last issue I listed all the solar eclipses (both partial and total) from 1940 to 2040. Listed below are the total (not partial) lunar eclipses for the same period.

Total lunar eclipses visible from Guernsey, 1940 - 2040

Date and time of mid-eclipse (UT)	Date and time of mid-eclipse (UT)
1942 Mar 03 0021	1996 Apr 04 0010
1942 Aug 26 0347	1996 Sep 27 0255
1945 Dec 19 0220	1997 Sep 16 1847
1946 Dec 08 1748	2000 Jan 21 0444
1949 Apr 13 0410	2001 Jan 09 2021
1950 Apr 02 2044	2003 May16 0340
1950 Sep 26 0416	2003 Nov 09 0119
1953 Jan 29 2347	2004 May 04 2031
1956 Nov 18 0648	2004 Oct 28 0304
1957 May13 2231	2007 Mar 03 2321
1963 Jan 09 2319	2008 Feb 21 0326
1964 Jun 25 0106	2010 Dec 21 0817
1964 Dec 19 0237	2011 Jun 15 2013
1968 Apr 13 0447	2014 Apr 15 0746
1971 Feb 10 0744	2015 Sep 28 0245
1971 Aug 06 1943	2018 Jul 27 2022
1972 Jan 30 1053	2019 Jan 21 0512
1974 Nov 29 1513	2021 Nov 19 0903
1975 May 25 0548	2022 May16 0412
1975 Nov 18 2223	2022 Nov 08 1059
1982 Jan 09 1956	2025 Mar 14 0659
1985 May04 1957	2025 Sep 07 1812
1985 Oct 28 1743	2026 Sep 28 0413
1986 Oct 17 1918	2028 Dec 31 1653
1989 Feb 06 1536	2029 Dec 20 2242
1989 Aug 17 0309	2033 Apr 04 1913
1990 Feb 09 1911	2036 Feb 11 2212
1992 Dec 09 2344	2036 Aug 07 0252
1993 Nov 29 0626	2040 Nov 18 1904

¤ ***David Le Conte***

Clementine news

After a near perfect mission to map the entire surface of the moon, Clementine, the Ballistic Missile Defence Organisation satellite has run into difficulties.

The satellite, which was testing 23 experimental technologies, suffered a malfunction of the on-board computer. The computer activated several of the satellite's attitude control thrusters during a 20 minute break in communications with the ground station. This used up all the available attitude control fuel, so it will be difficult to control the satellite accurately. It had been planned to send Clementine on to Geographos for a very close encounter in August 1994, but this may not now be possible. One option is to leave the satellite in Earth orbit and continue testing it's experimental instruments from there.

Clementine was launched in January 1994 to demonstrate that new, small, lightweight components, together with a streamlined management approach, could be used to build a craft quickly (< 2 years) and cheaply (< $100 million). Since January, Clementine has taken over 1.5 million images, mostly of the Moon, and has clearly shown the technology and approach to be sound. Its future is currently uncertain, but we will try to keep you informed.

Those of you with Internet access may like to keep up to date with the satellite.

Here is the address: Internet: clementine.s1.gov (or 128.15.32.9) (Username: anonymous; Password: your e-mail address, guest will also work) see pub/clementine directory. Or you could try Spacelink - modem direct dial: 0101-205-895-0028 Internet: spacelink.msfc.nansa.gov (or 192.149.89.61) (Username: anonymous Password: guest).

¤ ***Daniel Cave***

Where were you . . . . . on the 20th July 1969?

I was in a small apartment in Green Valley, in southern Arizona. It was crammed with people, some sitting on chairs, some on the floor, and all eyes were glued to the television and the first manned landing on the Moon.

The gathering comprised the men from the Smithsonian Satellite Tracking Station (actually called an "Astrophysical Observing Station") at Mount Hopkins, where I was Station Manager, and their families. In the days since the launch we had tracked the course of Apollo 11, and had photographed dumps of waste from the spacecraft (to study the space environment) until it was out of reach of our 30-inch f/1 Schmidt Camera. Now, in a party atmosphere, everyone was anxiously awaiting the safe descent of the lunar module, the opening of the door, and the barely discernible image of Neil Armstrong climbing down the ladder and stepping onto the Moon's surface.

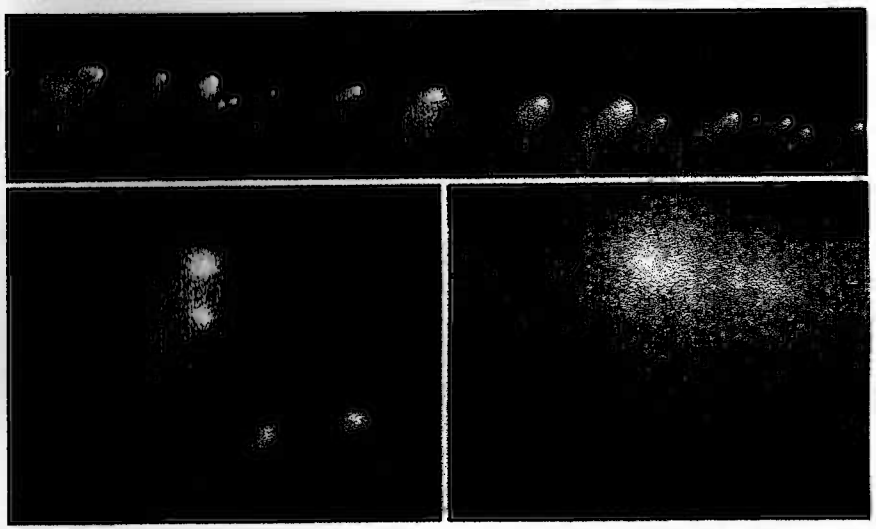
Our cheers at that moment were added to those of the 600 million other viewers. None of us knew then, or even gave a thought to where such a momentous event would lead; we only felt that it was both a climax and beginning, and our pleasure must, I suppose, have been enhanced by the small part we had played in this great adventure. For years we had observed and photographed the Mercury, Gemini and Apollo spacecraft, and many American satellites and astronomical objects, including spectacular comets and rocket launches, but somehow nothing would ever cap this event.

David Le Conte

We would like to hear of your reminiscences of this or other events.

Founder talk

David Falla, founder of the Astronomy Section, gave a talk entitled "New Branches of Astronomy" to sixth form pupils at Elizabeth College on Friday, the 22nd April.



Comet Shoemaker-Levy heads for a massive collision with Jupiter in July (Hubble Space Telescope picture)