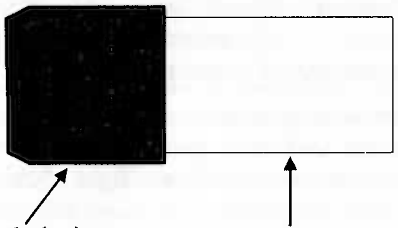
Advertisements

This space is available free to members for advertisements (preferably, but not necessarily astronomical).

Lost – eyepiece!

A 25mm eyepiece, belonging to Gareth Coleman, is missing. If found tel. 56649.



Wanted

A high-power eyepiece, eg 4 or 6 mm. John Taylor, tel. 47665.

The 1996 Programme

This year's Programme is included with this issue of Sagittarius. It is an exciting year, both for observing and for talks.

There are lunar eclipses in April and September, a solar eclipse in October, and two new comets.

Subjects of talks range from astronomical history (the discovery of Neptune) to the latest discoveries (infrared astronomy), from aliens (the search for extra-terrestrial life) to visitors from space (meteoroids, meteors and meteorites), and from passages of the Moon across the solar disc (solar eclipses) to similar passages of planets (the transits of Venus - looking forward to the 21st century!) ☆

Have you paid your subscription?

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 May. The deadline for publication materials is 15th April.

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Opinions expressed in Sagittarius are those of the authors, and are not necessarily endorsed by the Astronomy Section or La Société Guernesiaise.

Sagittarius

The Newsletter of the Astronomy Section of La Société Guernesiaise

March/April 1996

Forthcoming events

La Société Annual General Meeting
Wednesday, 6th March
7.30 pm at La Trelade Hotel

The Comets are Coming!
by David Le Conte
Tuesday, 19th March
8.00 pm at Candie Gardens

Total Lunar Eclipse
Wednesday 3rd April
11.21 pm to 2.59 am
at the Observatory

Infrared Astronomy
by Dr David Falla
Tuesday, 9th April
8.00 pm at the Observatory

In this issue

Birth of the Solar System

Two comets and a lunar eclipse

Inside

Major articles in **bold**

Centre inserts

March/April star chart

Moon phase calendar

The Comets are Coming!

David Le Conte will talk about one of his favourite subjects – **comets** – **at 8.00 pm on Tuesday, the 19th March, at Candie Gardens** (<u>**not the Observatory**</u>).

This illustrated talk is timed to coincide with the appearance of the brightest comet for 20 years – Comet Hyakutake. The new Comet, which was discovered on the 30th January, promises to present a spectacular appearance as it approaches within 0.1 astronomical units of the Earth in late March, and as it approaches perihelion in late April.

People in Guernsey will be well placed to observe this comet, as it will reach a declination of over 80° north in late March.

David will also take the opportunity to describe the appearance of Comet Hale-Bopp, which was discovered last year when it was beyond the orbit of Jupiter, and will reach naked eye magnitude this summer. This large comet is expected to be brilliant in the spring of 1997.

The talk will also describe the history and theory of comets, and the state of our current knowledge of them, and will be illustrated with slides. ☆

Total eclipse of the Moon

A treat is in store in April – **a total lunar eclipse.** It will take place **on the night of Wednesday/Thursday 3rd/4th April, starting at 11.21 pm (BST) and finishing at 2.59 am.** The total phase lasts from 00.26 am until 01.53 am. Mid-eclipse occurs at 01.09 am. This is a sight not to be missed, as the blood-red Moon hangs amongst a field of stars. Members are invited to watch it from the Observatory, where it will be possible to photograph it, and observe it through the telescopes.

The position of the Moon at eclipse is shown on the opposite page. ☆

Infrared Astronomy

On Tuesday, the 9th April, at the Observatory, David Falla will speak to us about **infrared astronomy**, a subject in which he is currently doing research.

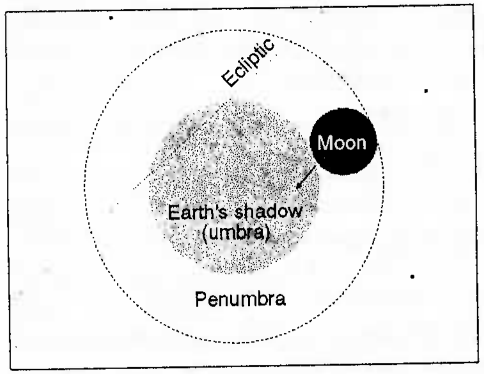
Infrared astronomy is concerned with the study of radiation emitted at the low-energy end of the radiation spectrum. It would therefore seem, at first glance, to be rather less exciting than some of the other branches of astronomy that have been developed over the past few decades. Radiation at infrared wavelengths, however, is related not only to atoms and molecules – the basic ingredients of everyday matter – but also to solid particles such as dust grains.

It is believed that these microscopic and sub-microscopic emitters of infrared radiation are directly involved both in the formation of stars and planetary systems and in their early stages of evolution. We live, it has been said, in a "dusty universe"; if that were not so then our Sun and the planets of the solar system, and therefore we ourselves, would not be here.

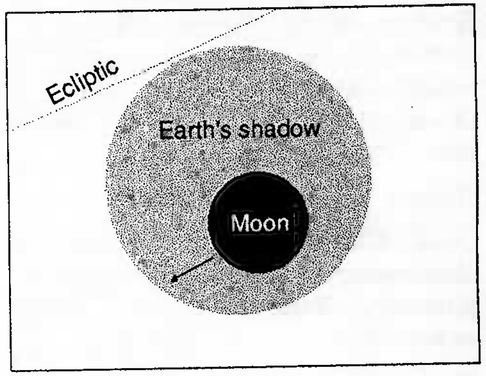
The most recently built instrumentation to study the infrared radiation from space is that aboard the Infrared Space Observatory (ISO), which was launched by the European Space Agency on the 17th November 1995. Within the past few weeks, the testing of the satellite's instruments has begun to yield interesting scientific data.

David's forthcoming lecture will give a general introduction to this field of astronomy; it will include a description of some of these first ISO observations, and also a mention of one particular project in stellar astrophysics. ☆

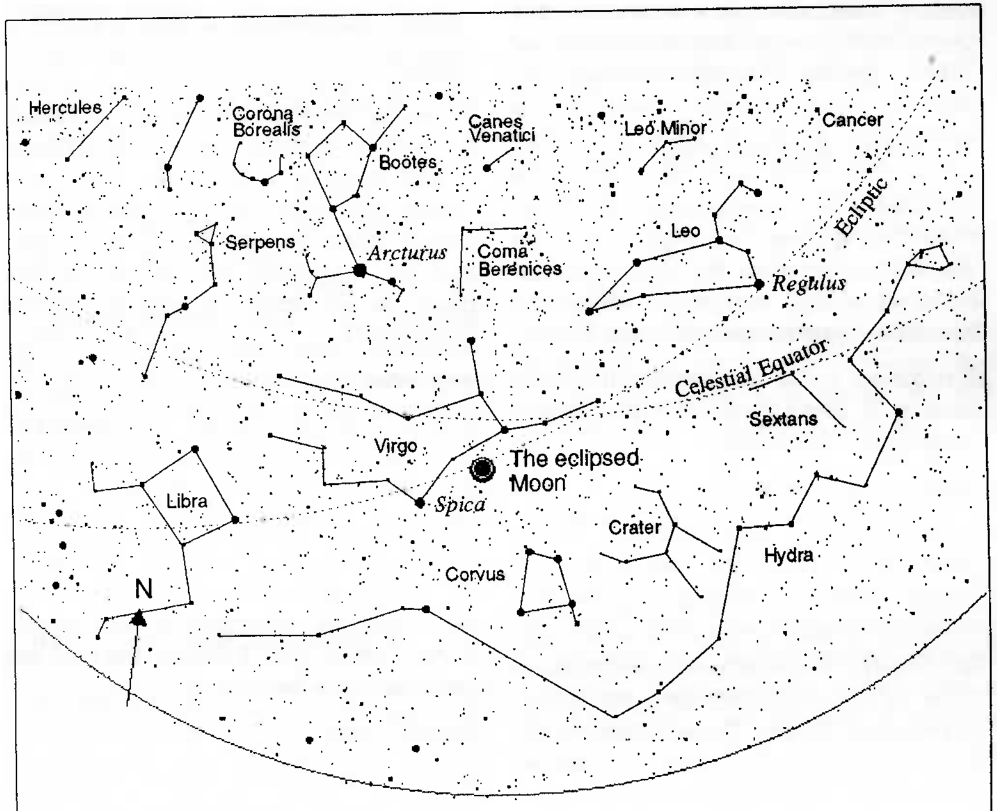
Total eclipse of the Moon, 1996 April 03/04, at 23h 21m to 02h 59m BST



Start of umbral phase of the eclipse, at 23h 21m BST



Mid-eclipse, at 01h 09m BST



The sky at mid-eclipse

Annual Business Meeting

Twelve members turned up for the Section's Annual Business Meeting on Tuesday, the 9th January, which resulted in a good discussion about the activities of the Section during 1995 and the coming year.

Officers

Geoff Falla, Peter Langford and David Le Conte were re-elected as Section Secretary, Honorary Treasurer, and Editor, respectively.

Finances

Peter's financial report for 1995 showed a healthy situation, with a surplus for the year of £325, giving a total fund balance of £1858. Income was £961, and expenses £636. The income included an encouraging figure of £526 from fund raising, of which £197 was from the Liberation Day event, £125 was from newsletter sponsorships, and £117 from donations. Expenses included newsletter costs of £107, equipment £330, and magazine subscriptions and library £141.

David made a plea for members to identify sources of sponsorship – for newsletters, programme and leaflets.

Solar telescope mirrors

Roger Chandler undertook to prepare mounts for the six-inch solar telescope mirrors, with a view to getting the new telescope up and running within the next few months. It will have a focal length of about 65 feet, producing a projected image of perhaps 8 inches. The telescope should be particularly useful during the partial solar eclipse on the 12th October, and it was agreed that this should be an Open Day (and evening) for the public.

Computer

The acquisition of a computer generated much discussion. It was agreed that the computer should have a specification along the following lines:-

PC 486 DX2 or DX4, Pentium 75MHz or 90 MHz (or faster).

8 to 16 MHz RAM.

400-800 MHz hard disc.

15-inch monitor, SVGA, colour.

CD-Rom drive, double or quad speed.

The computer should also be upgradeable. Optional, but desirable extras are:-

Modem, fast speed (eg 28,000 baud).

Printer.

It was agreed that a budget of £1200 for this purchase should be allocated, although it was recognised that other equipment, such as a flip-mirror CCD focussing device and a Telrad type pointing device, were desirable. A further £100 or so was also likely to be spent on upkeep of the Observatory.

Workshop

The possible construction of a workshop area was discussed, with it being agreed that an approach should be made to the Island Development Committee, subject to the agreement of our landlord. This raised the subject of the lease of the Observatory site, which is due for renewal this year, and it was agreed that a further lease of ten years should be sought.

Public visits

Members agreed with Geoff's suggestion that the weekly public evening opening of the Observatory should be changed from Tuesdays to Fridays. This would enable »» members to concentrate on their own observing relatively undisturbed on the Tuesday evenings. (*However, it has subsequently been decided to stick to the Tuesday nights.*)

Press publicity

Members agreed that there should be more publicity of Section activities, with a copy of the programme for 1996 being provided to the media, together with an article on what was happening in astronomy this year. Geoff suggested that a few of the articles which appear in Sagittarius could be sent to the Press.

Other business

It was noted that the 14-inch Celestron was still in need of refurbishment, but that there appeared to be little likelihood that this could be done this year.

It was noted that work was still needed on the main building door, the C14 building roof, and the plumbing. Concern was expressed about the fact that the neighbouring young trees on the southern boundary of the Observatory, which the neighbour had promised to move two years ago, had not been moved, and that would cause severe problems in the future.

Finally it was noted that the Section still required a working video recorder, with a television. ☆

Practical Observing

A small but appreciative audience heard Geoff Falla talk about Practical Observing on Tuesday, the 6th February. A full account will appear in the next issue of Sagittarius. ☆

Liberation bonanza . . .

We were delighted to hear that the States Liberation Day Committee had decided to donate the sum of £500 to La Société in recognition of the work done by members for the Liberation Monument. La Société has decided to give half of it, £250, to the Astronomy Section.

. . . and from La Société

La Société has decided to assist the Section with its computer purchase by contributing the sum of £500.

The combination of these two superb donations will assist our finances at a time when we have some major expenses, and we are most grateful to both the Liberation Day Committee and La Société. ☆

Computer tryouts

At the time of writing we are getting close to selecting a computer for the Observatory. We are trying out three computers to see how they perform with the CCD and astronomical software. Hopefully, we will be able to decide on a machine in the very near future. We will report progress in the next newsletter. ☆

Educational activities

On Wednesday, the 22 February we were due to have 14 Beavers and their parents at the Observatory. Unfortunately, the severe cold weather on that day, with high wind and snow flurries, forced a cancellation. It is hoped to reschedule the visit during March, before the advent of British Summer Time, as after then it gets too late for these 8-year olds. ☆

Comet Hale-Bopp . . .

Comet C/1995 01, better known as Hale-Bopp after its two discoverers, is due to reach naked eye visibility this year – a prelude to its expected spectacular appearance in the spring of 1997.

The table below shows its predicted positions and magnitudes from now until July 1996, and are derived from IAU Circular 6287. The positional uncertainty is about 2'. However, magnitudes are notoriously difficult to predict.

Predicted positions of Comet Hale-Bopp, March-July 1996

Date		RA h	RA m	Dec °	Dec '	Mag
Mar	08	19	23	- 21	17	8.8
	18	19	38	- 20	37	8.6
	28	19	42	- 19	55	8.4
Apr	07	19	44	- 19	11	8.2
	17	19	45	- 19	27	8.0
	27	19	45	- 17	40	7.8
May	07	19	43	- 16	52	7.5
	17	19	39	- 16	03	7.3
	27	19	32	- 15	11	7.1
Jun	06	19	24	- 14	18	6.8
	16	19	14	- 13	21	6,6
	26	19	01	- 12	23	6.4
Jul	06	18	48	- 11	24	6.2
	16	18	33	- 10	24	6.0
	26	18	19	- 9	26	5.8

Astronomy magazine gives the best viewing times over the next few months as:-

April/May 1996	Morning
June/July 1996	From midnight
August/September 1996	Evening

However, of course, the comet will be better seen when there is no Moon. ☆

. . . and Comet Hyakutake

The discovery of Comet 1996 B2 by Juji Hyakutake was reported on 31 January. It is expected to reach a magnitude of 1 at the end of March, when it comes closest to the Earth, just 0.1 AU (10 million miles) away, and even brighter at the end of April.

The table gives predicted positions and magnitudes to the end of April. They are taken from IAU Circular 6311. However, positions and, especially, magnitudes are still subject to some uncertainty.

Predicted positions of Comet Hyakutake, March - April 1996

Date		RA h	RA m	Dec °	Dec '	Mag
Mar	03	14	53	- 22	10	6.6
	08	14	54	- 20	09	5.8
	13	14	55	- 16	21	4.7
	18	14	55	- 07	39	3.4
	23	14	48	+ 22	35	1.4
	28	04	06	+ 78	49	1.1
Apr	02	03	11	+ 52	00	2.1
	07	03	05	+ 43	28	2.5
	12	03	01	+ 39	03	2.4
	17	02	55	+ 35	47	2.0
	22	02	47	+ 32	29	1.3
	27	02	37	+ 28	00	0.1

The comet will be well placed for observation from Guernsey in March and early April, moving from the east in the evening, high overhead, towards the west. It should make a superb sight – a precursor of an even grander sight next year when Comet Hale-Bopp reaches its maximum magnitude.

The positions of both comets between the dates given may be interpolated from the above data. ☆

David Le Conte

We're in *New Scientist*

The 17 February issue of *New Scientist* included a response by David Le Conte to a question posed in *The Last Word* column. For those members who do not regularly read the magazine, this column appears on the last page. Anyone can pose a question about a scientific or everyday phenomenon, and any reader can propose an answer. The best replies are published.

The question which David answered was entitled *Midday madness*:-

> *"There are more hours of daylight after noon than before it, particularly in summer. Does this mean midday is in the wrong place?"*

David's answer, which was slightly edited, was as follows. The magazine credited "The Astronomical Society of Guernsey", ie the Astronomy Section of La Société.

"The latitude of your correspondent in Reading is almost the same as that of Greenwich, but his longitude is one degree west.

Sunrise, local noon and sunset therefore occur about four minutes later than at Greenwich. The Standard Time used in Britain is based upon the Greenwich meridian, and Reading's local time is therefore four minutes later than clock time.

This means that, at Reading, the duration of daylight after noon, as shown on the clock, is on average eight minutes longer than the duration of daylight before noon. East of the Greenwich meridian afternoon daylight is, on average, shorter than morning daylight. At Greenwich the difference between the duration of morning and afternoon daylight, averaged over a year, is zero.

On any particular day, the difference between the duration of morning and afternoon daylight depends, not only upon the latitude and longitude of the place, but also upon the Equation of Time. This is the difference, in time, between the Mean Sun, which gives clock time, and the True Sun. It is caused by the eccentricity of the Earth's orbit around the Sun, and the tilt of the Earth's axis to its orbital plane. The Equation of Time varies during the year from minus 14 minutes to plus 16 minutes, and is the main reason for the difference between the time shown by sundials and that shown by clocks.

There is also a slight difference between morning and afternoon caused by that day's portion of the Sun's annual movement around the ecliptic.

The combination of the above effects can create a difference between morning and afternoon daylight of over half an hour at Reading.

None of this means, however, that midday is in the wrong place, merely that the Standard Time system, whose simplicity and uniformity are essential for communication, is necessarily an approximation to the Sun's complex apparent motion.

The further lengthening of the after-noon daylight, and shortening of before-noon daylight, during the months of British Summer Time are, of course, the intended result of the forward movement of clocks by one hour."

The *New Scientist* also published three other replies, about the origin and effects of different time zones. ☆

Observing Programme – March/April 1996

The section of sky for March and April covers the area from 9 to 13 hours Right Ascension, including the constellations Leo, Ursa Major, Canes Venatici, Coma Berenices and Virgo. Whereas the star chart for January and February included a number of star clusters but no galaxies, for March and April we have no star clusters but many galaxies which may be observed with moderate size telescopes, a few with binoculars.

Starting with the constellation Leo, we have two bright spiral galaxies (M 65 and M 66) close together and both around magnitude 9, while not far away there is another similar pair of galaxies, M 95 and M 96. Double star Gamma Leo (*Algieba*) is one of the best of its kind, with a close 4.4 arc-second companion.

In Ursa Major, the galaxies M 81 and M 82 can be observed in the same field of view with a low power eyepiece or with binoculars. M 81 is presented almost face on, and a relatively bright magnitude 6.9, while its companion M 82 is edge on to us. The *Owl Nebula* (M 97) is a rather difficult planetary nebula of magnitude 12, while galaxies M 108 and M 109 should be easier to find.

The small constellation Canes Venatici has its brightest star (*Cor Caroli*) as a double with a separation of 19.4 arc-seconds. M 94 is a bright spiral galaxy of magnitude 8, while Gamma (*La Superba*) is a deep red variable star.

Coma Berenices contains a number of galaxies, one of the brightest being *the Black Eye Galaxy*, M 64. The Coma Cluster of galaxies, a concentrated group of over 1000 galaxies, is at a much greater distance and only faintly visible with larger telescopes. Double star 24 Coma Berenices, an orange star with a blue-white companion, is visible in small telescopes.

In Virgo, there is M 104 (*The Sombrero Galaxy*) and a close separation double star (*Porrima*). Virgo also contains a large cluster of galaxies, some brighter than magnitude 9. One of the most interesting of these is M 87, a giant elliptical galaxy of magnitude 8.6. The galaxy is a radio X-ray source, and is surrounded by a halo of globular star clusters.

The brightest quasar, 3C 273, is also located in Virgo, 5 degrees north of Porrima, and appearing like a faint blue star at magnitude 13 – a difficult target but worth noting if it can be found. ☆

Geoff Falla

The table of objects for March and April is on page 9, the star chart on page 10 and 11, and the observing log on page 12. These centre pages can be removed for convenience.

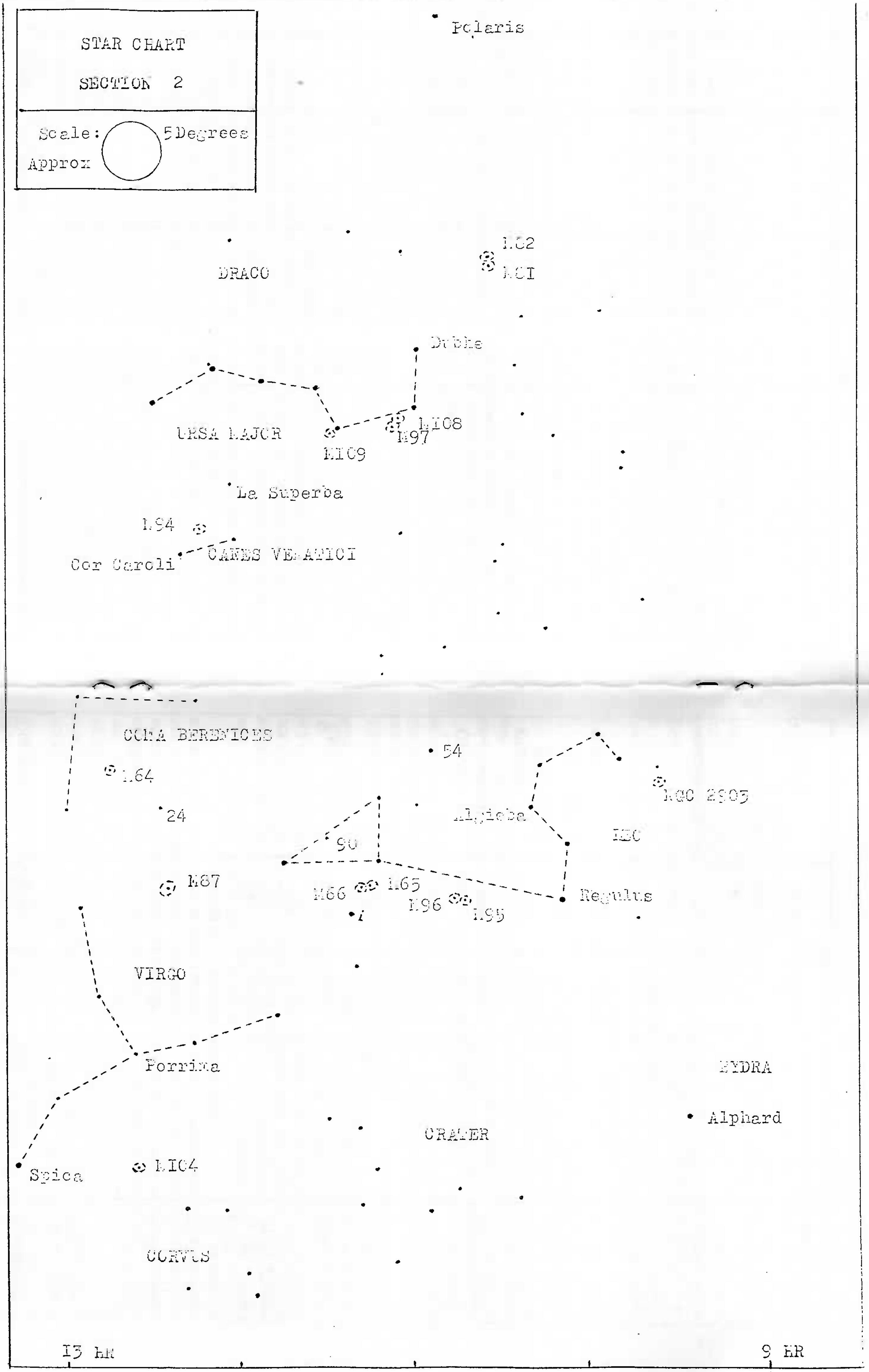
Don't forget to have a look also for Comet Hale-Bopp and Comet Hyakutake (see page 6).

Meteor? Space debris? UFO?

A report has been received of "something odd" in the sky, seen by two people at 10.45 pm on Saturday, the 10th February. They say it was a "red arrowhead shaped object" travelling at high speed roughly southeast to northwest at about 45° to the horizon. They were facing west when they saw it. Has anyone else seen or heard of this object? ☆

STAR CHART - SECTION 2

Constellation	Object	Type	Coordinates RA h m	Dec degs
LEO	M 65	Galaxy	11 19	+ 13.0
	M 66	Galaxy	11 20	+ 13.0
	M 95	Galaxy	10 44	+ 11.7
	M 96	Galaxy	10 47	+ 11.8
	Gamma γ	Double star (*Algieba*)	10 20	+ 19.9
	NGC 2903	Galaxy	09 32	+ 21.5
	Iota ι	Double star	11 24	+ 10.5
	54	Double star	10 56	+ 24.8
	90	Double star	11 32	+ 17.0
URSA MAJOR	M 81	Galaxy	09 56	+ 69.0
	M 82	Galaxy	09 56	+ 69.7
	M 97	Planetary nebula (*The Owl Nebula*)	11 15	+ 55.0
	M 108	Galaxy	11 12	+ 55.7
	M 109	Galaxy	11 58	+ 53.4
CANES VENATICI	Alpha α	Double star (*Cor Caroli*)	12 56	+ 38.3
	M94	Galaxy	12 51	+ 41.0
COMA BERENICES	M 64	Galaxy (*The Black Eye Galaxy*)	12 57	+ 21.7
	24	Double star	12 35	+ 18.4
VIRGO	M 104	Galaxy (*The Sombrero Galaxy*)	12 40	- 11.6
	Gamma γ	Double star (*Porrima*)	12 42	- 01.5
	M 87	Elliptical galaxy	12 31	+ 12.4
Additional objects:				
CANES VENATICI	Gamma γ	Variable star (*La Superba*)	12 45	+ 45.4
VIRGO	3C 273	Quasar	12 30	+ 02


STAR CHART
SECTION 2
Scale: 5 Degrees
Approx
Polaris
DRACO
M82
M81
Dubhe
URSA MAJOR
M108
M97
M109
La Superba
M94
Cor Caroli
CANES VENATICI
COMA BERENICES
54
M64
24
NGC 2903
Algieba
LEO
90
M87
M66
M65
M96
M95
Regulus
VIRGO
Porrima
HYDRA
Alphard
CRATER
Spica
M104
CORVUS
13 HR
9 HR

STAR CHART - SECTION 2 OBSERVATION LOG

Date	Constellation	Object	Observation notes, etc

The birth of the Solar System by Frank Dowding

What's the best place to start a description of the birth of the *Solar System*? The *Solar System* condensed from a gas cloud, but where did the gas cloud come from, what was it made from, and what did it contain? So I thought the best thing was to start at the beginning, from the very start of the *Universe*.

Now, I am fully aware that many members know far more about the *Big Bang* than I do, so I will be very brief on the subject.

Before the Big band there was no space or time, just pure energy. This energy then started to convert into matter – not matter as we know it today, but elementary particles far too hot for them to hold together anything resembling an atom. The temperature was around 100 thousand million degrees Centigrade.

After 100th of a second the size of the hot soup was about the orbit of Jupiter, and after only three minutes the particles were forming into the nuclei of hydrogen and helium atoms – just the nuclei.

Around 300,000 years later, by which time the Universe had become quite large, electrons had formed, and, because of the opposite charge of an electron and a proton, atoms of hydrogen and helium were being formed. Everything was still rushing outwards, but clouds of gas were becoming evident – clouds of hydrogen and helium, nothing else.

These clouds started to condense into galaxies – just galactic clouds at this stage, but with clumps of gas which became thicker and formed into stars – stars made of hydrogen and helium. »»

One such cloud was our own *Galaxy – the Milky Way*. But our own *Sun* did not evolve at this time. The Sun is at least a second generation star, and is certainly not made of just hydrogen and helium. There is carbon, oxygen, iron, magnesium and many other elements.

These heavier elements came from stars which are larger than the average. These stars are extremely hot in the centre, and have huge compression that causes a nuclear reaction to convert the hydrogen to helium. When the helium is exhausted, the hydrogen converts to carbon, oxygen, and all the way up to iron.

These are called *Super Giant* stars, and when the core's nuclear reaction starts to tail off it cannot prevent the star from collapsing, in turn producing an explosion which in itself produces heavier elements. The whole star becomes a *supernova*, and throws out its contents to mix with the hydrogen and helium clouds.

There is a supernova explosion about every 25 to 50 years in our Galaxy. We don't see this many because our view is hidden by dust clouds as we try to look into the centre, but they are observed in other galaxies.

So, thanks to the initial Big Bang, the formation of hydrogen and helium atoms, and a further ingredient of a supply of heavier elements from supernovae from each generation of stars, there was a gas cloud from which our Solar System was formed. This cloud probably had 99% hydrogen and helium, and 1% dust containing the heavier elements. »»

The cloud, like other clouds, has clumps of thick gas, because our Sun was not the only one to be formed. It is quite common for many stars to form from one gas cloud, but I will concentrate on just the clump from which we came.

Now, a gas cloud does not necessarily have to collapse. Although molecules attract one another they also tend to keep others at their distance by their very movement. After all, although it is called a cloud, the Earth's atmosphere at sea level is 100 thousand times more dense.

But once the gravitational effect overcomes the outward pressure, the cloud will start to condense. A supernova explosion can cause shock waves to start the motion off, and as the cloud condenses it naturally starts spinning, as it is a random movement, not a uniform collapse.

Due to the physics of angular momentum, it spins faster as it gets smaller, like a skater holding her arms out while spinning spins faster if she brings them in.

While the contraction continues there is a rise in temperature due to the gravitational energy changing to thermal energy. As it contracts further and the molecules become more excited they emit radiation, and as further contraction continues the radiation becomes trapped in the centre making it even hotter.

At this stage we are looking still at a gas cloud with a much denser spinning centre, perhaps ten times the eventual size of the final Sun. The temperature is around 2000 Kelvin. If we could see though the cloud it would appear as a faint luminous sphere. It is called a *protostar* – it can clearly be seen in the radio range.

It is then that something quite remarkable happens – it is called *bipolar outflow*. »»

It would appear that as the disc is rotating some gases are not quite making it into the centre sphere. They get close to it, but are flung our along each polar direction, by a stellar wind. The particles are heavier than the average, and are attracted back to the sphere, but as a ring around it, mixing with the other gases circling the sphere. This is the *planetary material.*

We shall now leave the protostar, continuing to collapse – not a bright object, but definitely glowing – and look at the planetary material.

The whole area was still within a gas cloud, with a hot sphere at its centre, and the cloud is very thick. About where the Earth was to form was around 2000°C, and around Jupiter was 400°C. This was hot enough to break all material closer to the Sun into its individual atoms, but further out many grains and rocks survived intact.

As the Sun continued to gather more gas and dust, the cloud became less dense and therefore cooler. This allowed the material left to cool and meet up with other elements, the heavier elements forming first, such as nickel and iron.

Although at this time the *proto-Sun* was getting hotter, the *planetary nebula* was cooling, without the surrounding gas to sustain the heat.

It took around 2000 years for particles to form into objects 10mm across, and 5000 years for those further out. As the dust was circling faster around the proto-Sun these particles were forming quicker than the outer regions. As time went on the particles became larger until there were hundreds of *planetoids* about 10 km across.

These planetoids, as they are called, were now large enough to attract one another, and on doing so the smaller of the two »»

would break up. The resulting fragments would fall back on the larger.

Because the outer regions of the gas cloud were not so affected by the temperature rise as the inner area, there was a large mass of material available for attracting each other. It took longer, but Saturn, Jupiter, Uranus and Neptune were to become bigger, mainly consisting of gas, rock and ice. Jupiter became larger before the others.

It took around 100 million years for the planets to form, and all were similar. They were actually similar to the Sun in that as each became larger so their interiors became hotter.

The inner planets had an abundance of different metals and composition due to the first heating and the condensing of the clouds, whereas the outer planets had a more primitive form. But each had an atmosphere of hydrogen and helium, and was gathering more all the time.

Meanwhile, the Sun had grown to a critical stage. Its inner core had become so hot due to the pressure that a nuclear reaction was happening. The hydrogen in the core was changing to helium, known as *hydrogen burning*. The energy being produced was enough to stop any further contraction, and the protostar became a star, with an inner temperature of around 15 million °C, and a surface temperature of 6000°C.

It took around 1000 million years from the start of particles coming together to *nuclear fusion*. During nuclear fusion the energy released produced photons which only moved about 1 cm at a time before creating another energy sequence. This was a sort of *random walk*, which could take a million years to reach the surface, first as *gamma rays* at the centre, then *x-rays*, till finally *light waves* at the surface, and produce »»

enormous light that we see.

At a very early age of this huge internal pressure, the Sun went through a *T Tauri* stage, where a huge amount of its surface was blown off. The wind that was produced was the cause of Mercury, Venus, Earth and Mars loosing all their hydrogen and helium. Jupiter, Saturn, Uranus and Neptune held onto theirs.

The *asteroid belt* is now thought to be the remnants of the original material. When planets were being formed, but the large mass of Jupiter prevented the material forming a planet between itself and Mars.

The T Tauri phase distributed the material from this orbit, and erratic movements were largely responsible for the craters observed on the inner planets. Mercury was particularly hit from all sides.

The planets with moons achieved them in a variety of ways. Those with near circular orbits were formed from dust clouds around the planet, in the same way as planets formed around the Sun, such as the Galilean satellites of Jupiter. But satellites with a retrograde or elliptical orbit were more likely to be captured.

Comets either formed as small planetary embryos in the outer regions, or may have been flung there by getting too close to Jupiter.

Volcanoes started on the Earth, Venus and Mars, producing carbon dioxide on these planets. The Earth produced water and nitrogen. Both Venus and Earth had oceans at an early stage. Mars, it appears, had water as well.

On Venus the water evaporated due to dense clouds and its close proximity to the Sun. The Earth held its water and life forms in the ocean absorbed the »» carbon, releasing the oxygen. Mercury has hydrogen and helium from the Sun. Tectonic plates erased the Earth's craters.

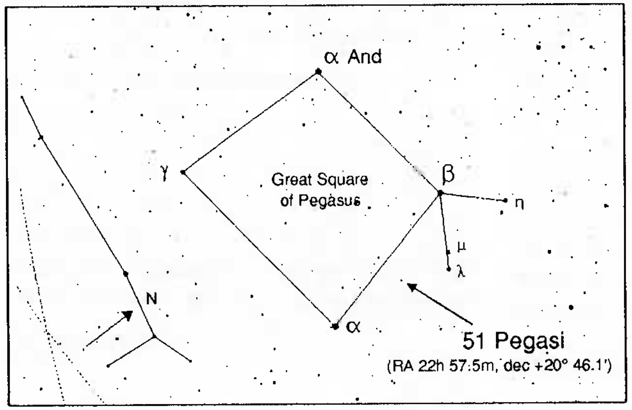
It is believed that our Moon was at one time a planetary embryo which collided with the Earth and bounced off, shattering to pieces, much of it falling on the Earth, but the rest re-forming into its present shape. ✩

Frank Dowding

Four planets discovered?

First it was one, then two more, and yet another. Last October evidence for the first planet around a sun-like star was announced. The star was 51 Pegasi, and long-term observations of wobbles in its movement showed the possible existence of a giant planet, the size of Jupiter, but very close to the star.

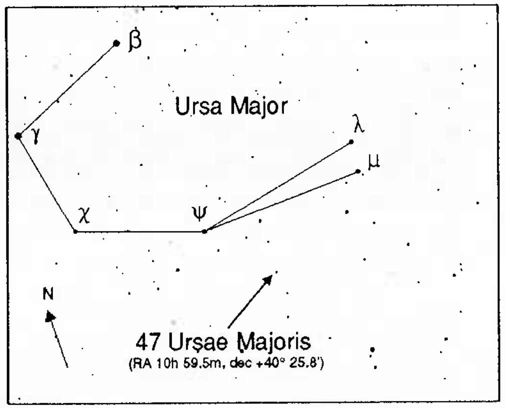
Now wobbles of two other sun-like stars, 47 Ursae Majoris and 70 Virginis indicate the presence of planets, in both cases much bigger than Jupiter. Finally, the disc of gas and dust around the star β Pictoris shows signs of distortion which may be due to a planet.



The accompanying charts show the positions of these stars. Their properties (magnitude, distance in parsecs, spectral class, and luminosity in suns) appear in the table below.

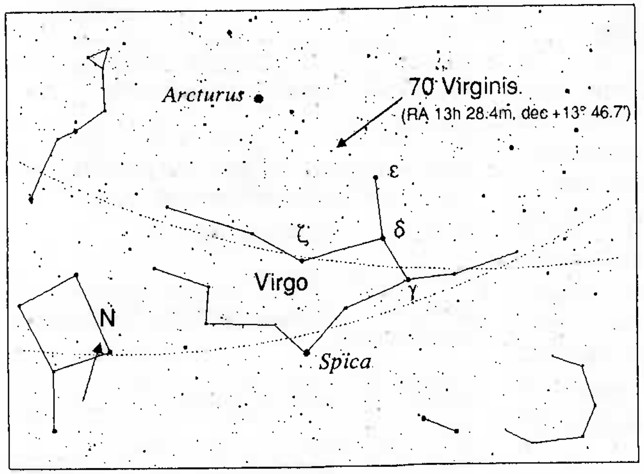
All these stars are visible to the naked eye, although you will have to travel south the see β Pictoris! ✩

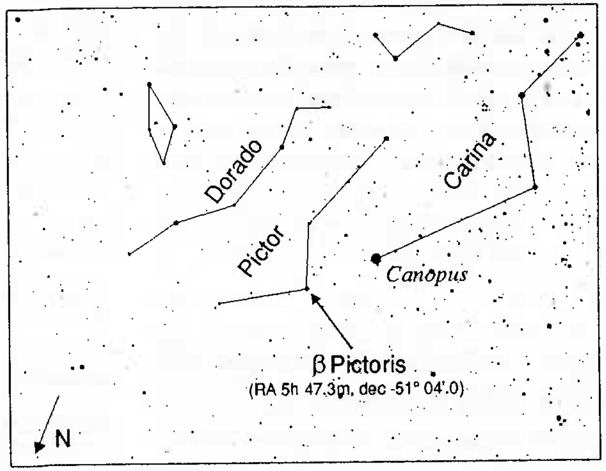
DLC



	Mag	Dist (pc)	Class	Lum (suns)
51 Peg	5.5	13	G4	0.88
47 UMa	5.1	13	G0	1.30
70 Virg	5.0	10	G5	0.82
β Pict	3.9	24	A5	13

(The Sun's spectral class is G2.)





Solar eclipse conference?

Members probably saw reports in the Guernsey Evening Press and the Guernsey Globe about an initiative of the Tourist Board to arrange a major astronomical conference in Guernsey at the time of the total solar eclipse in August 1999. Recognising the great attraction of the eclipse, and the fact that the path of totality passes through the Bailiwick (although not quite Guernsey itself), the Board is working at organising a conference for 250 professionals and amateurs. »»

Early in its planning the Tourist Board sought advice from Section member David Le Conte. The Board's plans include flying conference delegates to Alderney on the 11th August, to view the eclipse from within the band of totality.

In Guernsey the eclipse will be about 99.9%, and Baily's Beads (caused by sunlight coming through the lunar valleys) may well be visible. ✩

DLC

Double Summer Time

In the July/August 1993 and September/October 1993 issues of Sagittarius we gave some views of astronomers against the introduction of double summer time.

Good news then, when the British Parliament voted on the 19th January 1996 against the British Time (Extra Daylight) Bill, which would have changed British time to be the same as Europe. The Bill appears to have been lost because of opposition by Scottish MPs, fearing the effect of dark winter mornings.

Astronomers' arguments have been based on the fact that in summer it would not become dark until very late (after midnight in June), that Britain is further north than most European countries, that even if Britain changed there would still be three time zones within Europe, that the USA copes well with more time zones, and that the "natural" time zones are important.

In 1995 the British Astronomical Association held a debate about the subject. The voting was 9 for a change, 82 against, and 12 abstentions.

The States decided in 1988 not to change Guernsey's time until the UK did so, and that remains its policy.

As shown by the bibliography below, the subject has roused considerable interest in Guernsey in the past. ☆

DLC

References and Bibliography

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Some Effects on Accidents of Changes in Light Conditions at the Beginning and End of British Summer Time, by Hilary Green, Supplementary Report 587, Transport and Road Research Laboratory, 1980

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Spring into summertime, Guernsey Evening Press, 30th March 1991

Single/double summer time idea brings extremes of opinion, Guernsey Evening Press, 26th September 1992

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RAC back double summertime plans, Guernsey Globe, 29th October 1992

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Light nights argument is finely balanced, Guernsey Evening Press (Comment), 27th April 1993

Islands probe change of time zone, Guernsey Evening Press, 27th April 1993

No early time switch, Guernsey Evening Press, 4th May 1993

Scrap GMT? Not yet! Guernsey Evening Press, 16th August 1993

'Clocks in the UK should be put forward by one hour throughout the year', J.Br.Astron.Assoc. **105**, 4, 1995

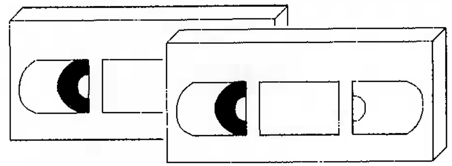
Time runs out for extra daylight Bill, Daily Telegraph, 20th January 1996

Speaker needed

You will note that the 1996 Programme includes a vacancy for the May meeting. This is because the talk planned for that month has been brought forward to March, as a result of the discovery of Comet Hyakutake. Therefore, a speaker is needed in May.

Would *you* like to give a talk or lead a discussion on the 7th (or 14th) May? ☆

Videos



Don't forget that the following videos are available for rent by members (£1.00 for two weeks).

The Man Who Colours Stars *50 mins*

The life and work of David Malin, the world's top astrophotographer.

Christmas Star *50 mins*

Theories about the star of Bethlehem.

The Universe *30 mins*

A NASA film about the solar system, star birth, galaxies, black holes, etc.

The Voyager Missions *30 mins*

The Voyager spacecrafts' visits to Jupiter, Saturn, Uranus and Neptune.

The Dream is Alive *37 mins*

A window seat on the Space Shuttle, shot by astronauts. Spectacular IMAX images.

For All Mankind *77 mins*

NASA footage of the manned Moon flights.

The Making of a Monument *22 mins*

The development of the Liberation Monument, from its concept to its completion and unveiling.

Liberation *55 mins*

Guernsey's 1995 Liberation celebrations, including the Liberation Monument. ☆

The Lunar Society

In the March/April 1993 issue of Sagittarius I mentioned the Lunar Society, and said that it was a 19th century philosophical society, whose members met on the night of the full moon, so that their horses could see their way home.

On the 23rd January 1996, the Channel 2 program *Local Heroes* reported that the Lunar Society was in fact a scientific society, founded in Birmingham in1766 by Matthew Bolton, Erasmus Darwin (Charles's Grandfather), and William Small. It included amongst its membership Watt and Priestley.

The society members met at 2.00 pm for dinner, and, after much discussion, rode their horses home by the light of the full moon. Apparently the house where they met is now a hotel, the Friendship Hotel.

If anyone knows more about this society, I would interested in hearing about it. ☆

David Le Conte

Did you know?

At precisely 08h 03m 46s on the 20th March the Sun will cross the Celestial Equator on its journey northwards. This is the time of the *Vernal Equinox* given by the US Naval Observatory *Floppy Almanac*, the astronomical prediction software which gives results as accurate as the *Astronomical Almanac*. At that time the Sun's Right Ascension and Declination are both zero. By definition this place, where the Ecliptic crosses the Celestial Equator, is the *First Point of Aries*, the point on which the equatorial system is based. The term *Equinox* refers to the equal lengths of day and night. ☆

DLC