GNOMON

Newsletter of the Association for Astronomy Education

Vol.18 No. 3 | ISSN 0952-326X | SPRING 1999

PRIVATE BENEFACTOR UNVEILS PLANS FOR WORLD'S BIGGEST EDUCATIONAL TELESCOPE

A former cosmology student announced plans for a 3m telescope, which is intended for use by pupils at British schools.

Dr Dill Faulkes' telescope will be built on the Hawaiian island of Maui and will be run by astronomers based at the Royal Observatory, Greenwich. Pupils will access the telescope via the Internet to gather pictures and data about the universe. The telescope, which has a light-collecting mirror two metres in diameter, will be the world's largest telescope for educational use. First light is expected in 2001.

Dr Faulkes, who studied mathematics and cosmology before a career in computers, is funding the telescope as the first project for an educational trust he set up last year.

"The key to the future success of British science, and through science the success of British industry, is our children. We have to inspire them and give them the best possible start, both inside and outside the classroom, so that they are equipped to take Britain into the next millennium." Dr Faulkes said.

"I am a product of the British educational system, which I consider to be second to none. Unlike most people I was nearly 30 when I finished my studies in mathematics and cosmology. I can thank my parents for allowing me all those years in school and university and the state system for giving me a free education."

The Faulkes telescope will be controlled by school children in Britain and will be sited at 10,000ft on the central mountain of Maui. The time difference means that visitors using the telescope will "visit" Hawaii at night* just the right time to make best use of the island's clear skies.

The telescope will initially be accessed from the Royal Observatory's new Dyson Gallery, which will be opened by HRH the Duke of York today. The gallery, which has been largely funded by another private donation of £100,000, will focus on astronomy now and in the future. Today also marks the official opening of the Particle Physics and Astronomy Research Council AstroLine, a public information service on all aspects of astronomy and space science.

Dr M C (Dill) Faulkes was educated at Hinckley Grammar School and at an early age specialised in science under the Mason Plan. He got a degree in mathematics at Hull University and a PhD in mathematics at London University where he specialised in general relativity and cosmology. Dill spent a further three years doing post doctoral research on relativistic models of pulsating and collapsing stars. He joined Logica in the early seventies and began a career in computer software. He established Logica's office in New York and after five years in North America returned to the UK as managing director of another software house SPL. When this company was sold to System Designers Ltd, Dill started his own business initiating mergers and acquisitions of software companies.

With finance obtained from the successful public and private sale of several software companies Dr Faulkes has established a Registered Charity called The Dill Faulkes Educational Trust to advance the education of the public in the fields of science and mathematics. The first project for the charity is the Faulkes Telescope.

GNOMON - definition from the **Concise Oxford Dictionary:**
Pillar, rod, pin or plate of sundial, showing time by its shadow on marked surface, column, etc. used in observing Sun's meridian altitude.

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All communications (except those to the Editor) should be addressed to:

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Advertising Charges:

Whole page £120
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Publication Dates:

These are at the equinoxes and the solstices, that is four times a year.
Copy deadlines are two months *before* these dates.

Observations

A SHAMEFUL SCAM - WATCH OUT!

There is evidence of a growing confidence trick that besmirches astronomy in general and is of particular concern to *Gnomon* readers because it has been exploiting the inexperience of youngsters. The scam is to offer to name stars after a loved one. It is being done by more than one organisation (and why not? After all, we could all offer to name any star we liked after anyone we wanted to. It would be equally meaningless!) and in at least one case at least it is made to appear to be with the collaboration of NASA!

I have been asked by children, their mothers and others to identify a star in the sky which has been indicated on their exclusive map of part of the night sky, and which has been named after their grandfather or some loved one in the family. I have also received an invitation to name a star as a present for a loved one. This arrived by junk mail, faxed to me recently (along with the Yummy Yum Yum diet - I'm sure many readers will recognise it!). To get further information will only cost a £1 per minute by fax (which, surprise surprise, will take an inordinate time and is another scam!).

Unless the International Astronomical Union has been taking a leaf from the International Olympic Committee's book, these con artists should be stopped. Imagine Vindemiatrix being called Cuthbert.

Richard Knox

Letter to the Editor

Aluminised Mylar solar eclipse viewers

The article in the Winter 1999 issue of *Gnomon*, entitled "A new kind of eclipse-viewing filter" includes inaccurate statements about "aluminised Mylar" filter eclipse viewers. In particular, it implies that the viewers are not long-lasting, stating that the aluminium coating "tends to oxidise with age".

This is simply not true. The design of the *Solar-Skreen* viewers, which our Company supplies, has the aluminium coatings sealed between two layers of polyester film, commonly referred to as Mylar. The coatings are not exposed to the air, and do not, therefore, oxidise. Viewers made of this material have lasted many years.

Further, the article questions the strength of "aluminised Mylar". The polyester film is a very strong material, and can stand up to any handling which can normally be expected. It is unaffected by fingerprints and moisture, and the aluminium coatings are protected by being sandwiched between the layers of film.

The article also suggests that eclipse viewers in the form of spectacles are "not very practical". On the contrary, the spectacle design helps to ensure that they are held securely on the wearer's face, and that people wear them close to their eyes (some other forms of eclipse viewer have been seen being held at arm's length!). We also supply a hand-held version with a nosepiece cut-out, for use by people who wear spectacles. Given the choice, however, most people seem to prefer the former kind.

Recent suggestions in the broadcast media that eclipse viewers made of aluminised material have been withdrawn because of safety concerns are totally without foundation. Aluminised *Solar-Skreen* eclipse viewers meet the highest safety standards. They have a long track record, having been safely used by millions of people for 20 solar eclipses over the past 25 years. They are fully certified under the Personal Protective Equipment (PPE) Regulations, carry the "CE" mark, and conform with EC Directive 89/686/EEC and the UK Solar Eclipse Safety Code.

Any device supplied specifically for looking direct at the Sun, and which is certified for that purpose under the PPE Regulations, is suitable for the purpose of watching the partial phases of the forthcoming solar eclipse, just as are the familiar methods of solar image projection. It is vital that we in the astronomical community play our part in ensuring that people enjoy the experience of the eclipse, by whatever means, provided it is safe.

Yours faithfully,

David Le Conte, Director, Eclipse 99 ltd.

I hope the article did not give an impression that aluminised Mylar was unsafe in any way, particularly as I have used it extensively for many years, and will continue to do so. But I have found that some makes show signs of age - which affects its optical performance more than threatening its safety. I am happy to learn that Solar Skreen *Mylar filters do not suffer this. In my experience, dark polymer filters (which are homogenous) are more resistant to rough handling, and give an improved appearance of the Sun, including when checking for naked eye sunspots. Ed.*

PPARC Small Award Scheme in public understanding of science and technology

The Particle Physics and Astronomy Research Council invites applications for its Small Awards Scheme for public understanding of science and technology. The 1999 closing dates for completion of applications are 10 April and 10 October.

This is an open scheme - anyone can apply. Awards can range from £250 to £10,000 (maximum) per project. The expenditure can go towards materials, salaries, travel & subsistence. Some slight preference may be given to projects involving young people and schools.

Projects must be relevant to publicising or teaching PPARC funded science areas, namely: particle physics; space, ionospheric, solar and planetary science; astronomy, astrophysics and cosmology.

For application materials or information please contact:

PUST Office Room 2232, PPARC, Polaris House, North Star Avenue, Swindon, SN2 1SZ.

http://www.pparc.ac.uk/role/notes.html

Answerphone 01793 442123 Fax 01793 442002;

E.mail: pr_pus@pparc.ac.uk

The 35th International Astronomical Youth Camp 1999
See the Total Solar Eclipse in Hungary

The International Astronomical Youth Camp (IAYC) 1999 will take place in a pleasant castle in the small town of Vep, near Szombathely in Hungary from 1 to 22 August 1999. The August 11 total eclipse of the Sun will be visible from within a narrow corridor which crosses Europe. The camp house is located only a few kilometers from the central line of the eclipse. At 12h50 local time we will be able to observe the totality for 2 minutes and 22 seconds near the hostel. This is one of the longest durations of the totality along the entire central line.

The camp is about more than observing the solar eclipse. As a participant you join one of the eight Working Groups - together with other young people - working on astronomical projects. The projects vary from night time observations to theoretical problems, depending on your own interests. The Working Groups are led by young scientists from the IAYC team. The subjects range from practical to theoretical topics, including the solar system, astrophysics, cosmology, deep sky, ancient astronomy and others.

Apart from the astronomical programme, there are many non-astronomical activities such as group games, sporting events, singing evenings, hiking tours and an excursion. Since it is an international camp, the camp language will be English. The accommodation for IAYC 1999 will be a small castle that offers plenty of space for all participants and working groups, and includes our own darkroom.

Every year there are participants from at least 12 different countries. Anyone between the ages of 16 and 24 who is able to communicate in English may participate in the IAYC. The total fee for accommodation, full board and the whole 3 week programme, induding the excursion, will be in the range of 600 to 700 DM (US$330 to 380).

Interested persons from countries with non-convertible currencies can contact the organisation for special arrangements. If you are interested in participating, further information is available at our website:

http://www.iayc org/

or you can request an information booklet, free of charge, including an application form from:

IWA e.V., c/o Gwendolyn Meeus, Parkstraat 91, 3000 Leuven, Belgium, or e.mail info@iayc.org

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THE THINGS PEOPLE ASK

by **Query**

Some more extracts from Query's postbag (actually e.maill)

● *"rogar" asked: when is the next lunar eclipse going to happen?*

The next lunar eclipse will be partial, on 28 July 1999, and will be visible mainly from the Pacific Ocean region. The next total lunar eclipse will be on 21 January 2000, and will be visible from North and South America and parts of Western Europe including the British Isles, Spain and Portugal. Further east, the moon will set during eclipse.

There will be another total lunar eclipse on 16 July 2000, visible from the Western Pacific, Australia, New Zealand, and Japan. The moon will set while eclipsed for observers in western parts of North and South America. Eclipses sometimes occur in pairs of lunar and solar eclipses, two weeks apart. Two weeks after the partial lunar eclipse of July 1999, on August 11, there will be a total eclipse of the Sun. The path of totality will cross Cornwall, Devon and Alderney in England, then pass across parts of France, Germany, Austria, Hungary, Romania, Bulgaria, the Black Sea, Turkey, Iraq, Iran, and finally India. This will be the last total solar eclipse of the 20th Century., the next being 21 June 2001, in the South Atlantic and Southern Africa: Angola, Zambia, Zimbabwe, Mozambique, with the still-eclipsed Sun about to set when observed from Madagascar.

(Interestingly there will be seven eclipses in three eclipse "seasons" in 2000! As well as two lunar eclipses there will be four solar eclipses, on February 5, July 1 and 31, and Christmas Day. All these will be partial, however. Ed.)

● *Linda Amor from the USA wanted to know: How could I find out about lunar activity on my birthdate of 9/15/55? My mother told me I was born on a full moon with an eclipse and I'd like to know if there was actually one on or about that time.*

Query has access to the excellent library of University of London Observatory at University College London, which has a collection of old almanacs that are useful for answering this sort of question. There were three eclipses in 1955, but only one lunar eclipse, which was partial, on 29th November. There were two solar eclipses, on 20 June and 14 December. The partial lunar eclipse was not even visible from the USA! On 16 September the Moon was new, so on the day before it was "almost" new. All I can suggest is that childbirth can be very stressful to mums, so perhaps your mother may be remembering a lunar eclipse the following year when you were a toddler. *(We should add, try the "age of the Moon" calculation described in the last issue of Gnomon. Ed)*

Query

International meeting for mobile planetaria

Every two years, there is to be a meeting for users of mobile planetaria. The first one was held in Brescia, Italy. This May, the mobile users meeting is to be part of the French National Planetarium Association annual get-together .It will be held in the Salle de Paris in the Council of Europe, Strasbourg, on the 11th. 12th. and 13th.of May. It will have translation facilities for English and German. If any reader wishes to know more please contact Ray Worthy on 01429 268086, or e-mail: raymond@stargazr.demon.co.uk

For Your Library

Sky Atlas 2000.0 Second Deluxe Edition. Wil Tirion, Roger W. Sinnott. Cambridge University Press. 352pp. ISBN 0 521 62762 1 (softback) £29.95

Unlike *Norton's Star Atlas,* this one has only sky maps. But is it a triumph of celestial cartography that any habitual observer of the sky would welcome. For educational establishments with associated serious astronomical societies, or for individual observers, this is a must.

Comparisons with Norton's are perhaps unfair as this is a set of 26 large (about 48cm wide by 33.5cm high folded once, and which open out flat, like Norton's used to do), full colour, precision maps with a scale of 8.2mm per degree, in which most of the "Objects of Interest" tables in Norton's are incorporated in the colour coding and stylisation of the presentation of the maps themselves. Large maps are not practical for use outside in the conditions typical of an observing session, except for those lucky enough to have an observatory, but the Atlas will be invaluable as a reference, for finding more difficult objects, and for fixing the position any object in the sky, using the transparent overlay scales provided.

The Second Edition includes stars down to magnitude 8.5, a total of 81,312 stars compared with 43,000 to magnitude 8 in the 1981 first edition. Deep space objects are included down to even fainter magnitudes, and are drawn to scale, rather that represented by symbols, wherever large enough. The new maps are based on the latest measurements of the Hipparchos satellite, together with variables missed by Hipparchos from the *General Catalogue of Variable Stars* (Kholopov *et al* 1985).

Add to this features including extra large-scale charts of the Virgo/Coma galaxy clusters, the Orion nebula region, the Pleiades, polar regions and others, and, not least, the representation of the Milky Way with four levels of luminosity, and this becomes a veritable *magnum opus.* So, not a replacement for Norton's, but an essential companion.

Richard Knox

Getting to grips with children's misconceptions

Each year I visit about 30 primary schools to give a talk, illustrated with slides, called "A Tour of the Universe", to children studying the Earth and Beyond topic of the National Curriculum at Key Stage 2. To get 30 replies I have to write to about 270 schools. The talk lasts about one hour. I start from the Sun and and travel outwards, ending up with the Hubble Deep Field photo of the most distant galaxies ever seen. I explain the main features of each object on the way, asking the children questions and encouraging them to ask questions as we go along, to make the talk as interactive as possible.

Children are usually familiar with the relative sizes of the Sun and planets from posters, yet when I ask them to name the largest objects in the Universe, Jupiter usually crops up! But diagrams cannot show both sizes and distances to scale, so to demonstrate these I use a small football for the Sun, with a tiny pea in the corridor outside the room as the Earth. Jupiter is a big marble at the other side of the playground, and Pluto a pinhead 10 minutes walk away (at some familiar landmark). With the nearest star another football in the middle of the USA, the enormity of space is clearly shown.

Sizes of objects in space shown on a screen mean more if related to familiar objects. Hence Phobos and Deimos could fit on the Isle of Wight, London could fit into the crater Eratosthenes on the Moon, with the M25 running around its rim (the best place for it!), and the "dirty snowball" at the nucleus of a comet is the size of a large city.

To show how gravity keeps a planet in orbit, I use a cut bicycle inner tube to represent gravity, although its load/extension characteristic does not quite match Newton's Law. One child is the Sun holding one end of the tube and another child is a planet holding the other end and attempting to walk away in a straight line. After several false starts when the planet is determined to drag the Sun out of the Solar System, the planet gets it right and submits to a circular orbit.

I am frequently asked if you can walk on the rings of Satum. So to prove you cannot I use a sheet of polythene with small stones and pieces of polystyrene stuck to it, to represent the rocks and ice of which the rings are composed. I have also made a polystyrene model of the Milky Way, to show its shape.

Boys, especially, are fascinated by the prospect of celestial disasters, and often ask whether the Sun will blow up, will an asteroid hit the Earth, or a meteorite hit an astronaut? When I explain that in about 5 billion years the Sun will expand out nearly to Earth's orbit and Earth will become uninhabitable, I have to reassure the children that man will have moved everyone to another suitable planet long before, and, to be politically correct, taken all the animals too.

Children tend to confuse science fiction with fact, believing that manned spaceflight is commonplace. I am frequently asked if I have ever visited another planet! I think they are disappointed with the truth that man has not been further than the Moon, and that only one British national (Helen Sharman) has been into space. They are disappointed to learn that there is no proof that aliens have ever visited Earth, but I give some hope by saying that planets are now being discovered around other stars.

Children are especially interested in manned spaceflight, so I include a couple of Apollo 17 slides showing an astronaut on the Moon, with the Moon Buggy and the Lunar Module. There is a lot of detail to explain in these slides, and the children are dismayed that the buggy was left behind on the Moon after only about 3 days use, so I have to introduce them to some elementary rocket fuel economics to explain why.

Before I leave, I give the teacher a list of suppliers of posters, books, etc. and recommend the AAE teaching material. When I get a batch of enthusiastic thank-you letters from a class, it shows how interested the children are in astronomy and spaceflight. It's a pity that so little time is available for the subject in the curriculum.

John Thompson
Hon Secretary, Southampton Astronomical Society

Curriculum Corner

LOOKING THROUGH HOLES

Have you ever realised that you see everything through a hole? The pupil in our eye is a circular hole about 5mm across. What effect does looking through a hole have on what we see?

Holes allow light to pass through. Bigger holes allow more light through. When it is dark our pupils enlarge to help us to collect more light. We need as much light as we can get to see at night. On a bright day our pupils get smaller to prevent too much light entering our eyes. Two friends can work together with a hand torch in a darkened room to explore this. Try to make your pupils get smaller and then get bigger.

In the dark ***In the light***

Our eyes respond to light and dark conditions

Telescopes are just long tubes with holes at each end. They gather more light than our eye because the end that gathers light has a much bigger hole than our eye could possibly have, but they bring all that light down to a hole at the exit end which is about the same size as our pupil, so much more light from faint objects, like distant galaxies, which our eyes just can't detect normally, can be collected and brought into our eye. Astronomers use telescopes with really big entrance holes, to collect as much light as possible. The largest collectors of light are more than 5m diameter. This is a thousand times the diameter of your eye pupil and means that a million times more light can be collected compared with an eye pupil.

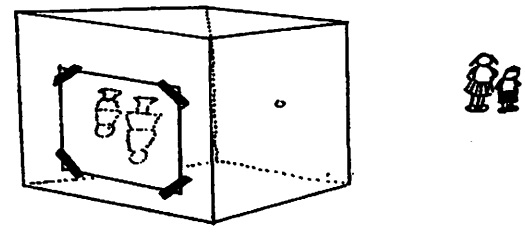
Really tiny holes.

Interesting things happen when you look through really tiny holes. Take a piece of kitchen cooking foil and with a needle (TAKE CARE) make a small hole in the foil. It will be so small that it will be hard to find. Now hold the foil up to your eye and look through the hole at a light bulb in another room, or some distance away. A street light is also a good distant light to look at. What do you notice about what you see? If you look carefully you might see the light being very fuzzy or blurred. Looking really closely you might see a pattern of light and dark spaces near the light. They might be circular. This happens because light travels like a wave. The light waves pass through the hole and spread out making a fuzzy pattern.

A pinhole camera.

The simplest camera uses just a small hole the size of a pin. It is called a pinhole camera. You can easily make one with an empty box. Cut a square out of one side of a box and make a pinhole through a piece of foil over a hole in the middle of the opposite side. Tape a piece of tracing or grease proof paper over the missing side.

From a dark room point the pinhole towards the door or window where it is bright outside. Look at the tracing paper and you will see an upside down picture. You have made a pinhole camera. But why is the picture upside down? Look at the diagram, and remember that light travels in straight lines from every part of the people in the picture.

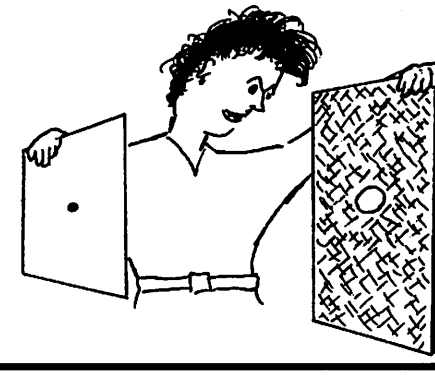


A home-made pinhole camera

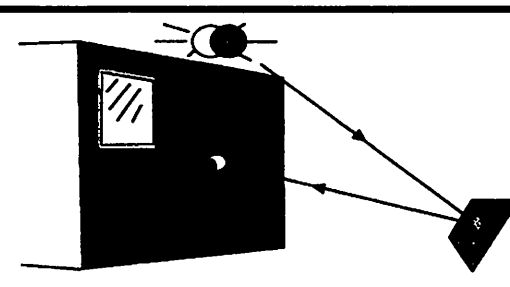
An image of the Sun.

It is very dangerous to look directly at the Sun. Never do this. But you can allow sunshine to pass through a pinhole and form a picture of the Sun on the other side. Try this with your pinhole camera. The picture of the Sun is called an 'image', but it is very small. A hole in a piece of card can form an image of the Sun on a more distant card or even on the ground but in either case, the image can only be made out if the "screen" is in shadow because it is now very faint. You may not be able to see at all. Try a hole about 5mm across. Then try a bigger one. The image gets brighter, but what else happens to it? If you use a kitchen colander you can make lots of images. This is something worth trying now. It will help you to prepare for the total eclipse of the Sun on August 11th this year.

A hole will project the Sun's image safely, but it's a bit faint



Looking at an image of the Sun on a screen - a piece of card or even just on the ground - is very safe. You are not looking directly at the Sun, only at an image. A really clever idea is to find a small flat mirror and an envelope. Make a lOmm hole in the envelope so that only a small part of



A small (10mm) hole in the paper in front of a mirror allows a bright image of the Sun to be reflected on to a wall or screen in the shade.

the mirror can be seen. You can bounce sunlight off this hole and onto a screen or a wall. This enables you to see the Sun's image on a wall which is in the shade. The image will be much clearer because of the contrast of dark and light.

During the partial eclipse that comes before and after the total eclipse, if you are lucky enough to be somewhere at the time where the Moon's total shadow will fall on the Earth, such as in West Cornwall, or throughout the eclipse if you are not in the West Country, you must watch the image of the Sun. As the Moon's disc begins to cover the Sun, it will make the Sun take on a sort of crescent shape - but it is still too bright to look at directly. If there are some trees around, look at the dappled sunlight on the ground beneath. The tiny holes between all the leaves act as pinholes that normally cast circular dappled blobs of light all over the ground. Now they are turning into hundreds of crescents!

Bob Kibble.

WORDS IN SPACE

Primary school teachers are skilled in seizing opportunities to integrate cross-curricular activities within a themed curriculum. I visited a student on placement at Donibristle Primary school in Fife earlier this term. June Bouaoun, a fourth year BEd student at Moray House, was in only her second week of the placement. The curriculum theme was Earth and Space and a feature of her classroom display was a wall covered with children's poems emerging from the Earth and Space theme. The standard of presentation and clarity of handwriting was excellent for a P5 class. The poetry itself was worth sharing. Here are three of my favorites. (I have typed them as they appeared on the wall - no amendments).

WHERE, WHEN, WHY?

Where did it start,
When did it start,
What made it start.
There was no before it because nothing was there.
Beyond definition it boggles the mind,
It must have been a miracle of some kind,
It created me, you the person beside us
Everyone, everthing that ever existed, it made them.

Our solar system it made but so cruel in size and features
Jupiter the chief, King and ruler,
Mars frightening, red and threatening
Saturn's rings of beauty, pride and passion
Earth with life, water and atmosphere
Venus, the honest, the brightest, proud
All the stars shining as they have for millions, billions, trillions of years
All of it space.

By Evan Oliphant, P5.

THE CONNECTION OF THE PLANETS.

At the dead of night if you look up
At the sparkling silver stars,
You can see queen Venus the planet and,
Her mighty brother Mars,
Soon not far of you can see,
Great Saturn with his bars,
Uranus and that Mercury messingers of the stars
Best of all mighty Jupiter
The official King of the stars
That is why I have told you the connection of the planets.

By Louise Femie, P5.

THE COMET

At night when it was dark,
I looked out of the window,
That was when i saw it,
A gleaming silver comet
Just like a star.

Slowly it climbed higher
Until it was right above me
Shining like a diamond
It was if someone had chalked it on jet black paper.

Then it disappeared
All that was left
Was a small white area where the comet tail had been
Soon that disappeared too,
All I could do was remember,
GOODBYE COMET

By Samantha Williamson, p5

At the time of writing, Venus, Jupiter and Saturn were visible to the unaided eye in the early evening sky. It is likely that Samantha did indeed see comet Hale Bopp a couple of years ago. P5 pupils are aged 9-10. My thanks to the staff and pupils at Donibristle Primary School.

Bob Kibble.

Go to School and Watch the Eclipse!!

The 3rd European Association for Astronomy Education summer school is to held in Briey, France 9-14 August 1999. It is publicised on the web at:

http://www.algonet.se/~sirius/eaae/suschoo3.html

The Summer school, conducted in English, is organised by Rosa M. Ros. It takes place around the total solar eclipse and is within the zone of totality!
It would be suitable for all people interested in Astronomy Education.

Alan Pickwick

Letter from Hawaii

Aloha! Every year seems to bring a rush of exciting discoveries, and 1998 was no exception. These, in no particular order, are some of the highlights of 1998.

Dusty disks around nearby stars

The quest for life elsewhere in the Universe has received a major kickstart in the past year or two, with the discovery of tell-tale signatures of Jupiter-size planets orbiting stars within a few light years of us. Even stars which don't show direct evidence for planets often show evidence of planets being born. In 1998, astronomers from the Joint Astronomy Centre in Hawaii and UCLA used the SCUBA camera on the 15 metre James Clerk Maxwell Telescope on Mauna Kea to take pictures of 3 stars familiar to most amateur astronomers: Vega, Fomalhaut, and Epsilon Eridani. Observing at a wavelength slightly shorter than 1mm), the star itself was almost invisible, but any cold dust orbiting the star shows up clearly. They saw dust in disks, shells, and even "doughnuts", suggesting some dust had been swept up, perhaps by planets still in the process of forming. Astronomers now plan to survey many more stars, to identify what fraction of stars might harbour their own solar systems.

The Near-Miss of 1997 XF11

When Brian Marsden of the International Astronomical Union's Central Bureau for Astronomical Telegrams issued an alert on March 11 to the effect that very preliminary orbit calculations for a recently discovered asteroid labelled 1997 XF11 indicated the possibility of an approach within 40000 km of the Earth on October 26 2028, scarcely could he foresee the attention this would receive in the world's news media. As the story spread, the words "preliminary" and "possibility" were dropped from the headlines, and world annihilation just 30 years away seemed inevitable. Fortunately, images of the asteroid were soon found in survey photographs from 1990, allowing a much more precise orbit to be determined, and the asteroid's closest approach receded to a mere million kilometres. While these events were widely regarded in the astronomical community as a fiasco (but as a dream-come-true by movie studios in the lead up to two summer movies on impact disasters, "Deep Impact" and "Armageddon"), it did briefly help focus attention on the need for a more coordinated and better-funded search and identification strategy for these Potentially Hazardous Asteroids (PHAs). Questions were asked in the US Congress about why NASA had not acted to set up a worldwide network of 2 metre telescopes, as recommended by a panel of experts (an effort that would cost far less than the budget of either of these movies). Unfortunately, little has happened since then, so we await the next near-miss (or hit?) to remind us just how vulnerable we are to catastrophic impacts with the "minor" members of our solar system.

The VLT Comes On-Line

For some years now, there has been a friendly rivalry between several telescopes with mirrors 8 metres or more in diameter to reach "First Light", that magic moment when the first pictures can be taken. One of the most ambitious such projects is the Very Large Telescope (VLT) of the European Southern Observatory (ESO), on Cerro Paranal in Chile. When finished, it will have not one, but four individual telescopes, each one with an 8.2 metre mirror and a complete suite of instruments. On the night of May 25 1998, the first telescope UT1 was brought online, and turned towards the famous southern globular cluster Omega Centauri. Images of the stars in this cluster were as sharp as had been hoped for, with resolution approaching 0.4 of an arcsecond. ESO plans to bring the other 3 telescopes into operation between now and the end of 2000. Meanwhile, both the Subaru and Gemini 8 metre telescopes here on Mauna Kea separately expect to achieve their own "First Light" in January 1999.

Supernovae and cosmology

For years, the bulk of supernova discoveries were made by amateur astronomers, tirelessly scanning nearby galaxies with their telescopes, looking for something that wasn't there before. Now, professional astronomers are fast catching up, but for some of them, it is not the supernovae themselves they are interested in studying. Rather, they hope to use a particular type of supernova (the Type Ia's), which are white dwarf stars that suck in too much matter from a companion star, and explode). By using these supernovae as "standard candles" which can be seen out to immense distances, astronomers hoped to be able to use them to learn not just how big the Universe is, but also the rate at which the Hubble expansion (due to the Big Bang) is slowing down. To their amazement, the early results from two competing groups suggest instead that the Universe is in fact expanding faster and faster as it gets larger! If true, this will require us radically to rethink ideas about how the Universe evolves, and came to be.

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Sky Diary Spring 1999

The chart shows part of the sky just west of south at midnight on May 15 from a site roughly in mid-Britain.

This time, the constellation names have been left out to allow you to practice your star pattern recognition! Start from the handle of the Plough (near top right of chart) and, using the old corny (but therefore effective) mnemonic, *arc* down to Arcturus, and *spike* down to Spica. Arcturus and Spica can be found in the real sky easily in this way. Arcturus is hardly difficult to find: a K class orange star, it is all on its own among the dimmer stars of Boötes and is the brightest star north of the celestial equator. It is almost in the centre of the chart.

Spica (mag. 0.98) is also fairly isolated, but not as bright as Arcturus (mag. -0.04). Spica can be found easily on the chart as Mars is passing close by, being almost at its closest on the date shown when it is about 4° to the north-east. In the last *Sky Diary* I suggested finding Mars as soon in the Spring as you can and sketching its daily motion through the stars of Virgo and Libra for as long as possible.

Spica is at the bottom of the tail of a sprawling Y of stars which leans to the west, with its western arm pointing a

Approx. rising and setting times

	April 15		May 15		June 15	
	Rise	Set	Rise	Set	Rise	Set
Sun	05h 30m	19h 15m	04h 37m	20h 01m	04h 12m	20h 33m
Mercury	04h 55m	16h 34m	04h 18m	18h 50m	05h 37m	22h 13m
Venus	06h 52m	22h 58m	06h 58m	23h 51m	07h 51m	23h 24m
Mars	20h 13m	06h 16m	17h 16m	03h 44m	15h 08m	01h 32m
Jupiter	05h 19m	18h 10m	03h 34m	16h 51m	01h 45m	15h 24m
Saturn	06h 07m	21h 02m	04h 17m	18h 25m	02h 23m	16h 43m
Uranus	03h 26m	12h 45m	01h 29m	10h 50m	23h 27m	08h 47m
Neptune	02h 50m	11h 43m	00h 52m	09h 45m	22h 49m	07h 41m

little north of westwards, beneath the right-angled triangle that forms the Tail of the Lion, Leo (The triangle is seen on the chart just inside the western edge of the chart, roughly at the same height as Arcturus as shown here). The eastern arm of Virgo's Y points almost north, towards the Hunting Dogs, Canes Venatici, just below the curve of the Plough's handle, In ancient star maps, the two dogs are shown held on leashes by Boötes, the Herdsman or Plough-pusher, and are chasing the Great Bear himself! Canes Venatici is not exactly startling, a pair of stars beneath the Plough handle being the best way to find it. The brighter of these two stars is known as Cor Caroli, meaning Charles' Heart after the executed Charles I, a rare honour.

The eastern (northwards) arm of the Y of Virgo can be continued north towards Canes Venatici through two faint stars, the southern being magnitude 5 alpha, and the northermost 4th magnitude beta of the constellation Coma Berenices. This is an area of sky that needs a very clear dark (moonless) night to fully appreciate its glory, shining like the legendary locks of Queen Berenice's Hair, the faint glittering of light from distant stars and the famous Coma cluster of galaxies gives the whole area a shining sparkle that can be seen almost entirely only with averted vision. The constellation has the appearance of a vast distant star cluster. It is well worth study in binoculars or telescopes. The third naked eye principal star, gamma Comae Berenices, is to the west of beta and almost makes a 45° triangle of the three faint stars. The Coma galaxy cluster almost merges with the even larger Virgo cluster immediately to the south, located mainly between epsilon Virginis (the northern end of the eastern Y-arm, Vindemiatrix - see Observations, page 2) and the Lion's tail Denebola, found on the Chart as the eastern point of the right-angled triangle making Leo's tail, and described above.

Moon phases for the second quarter of 1999

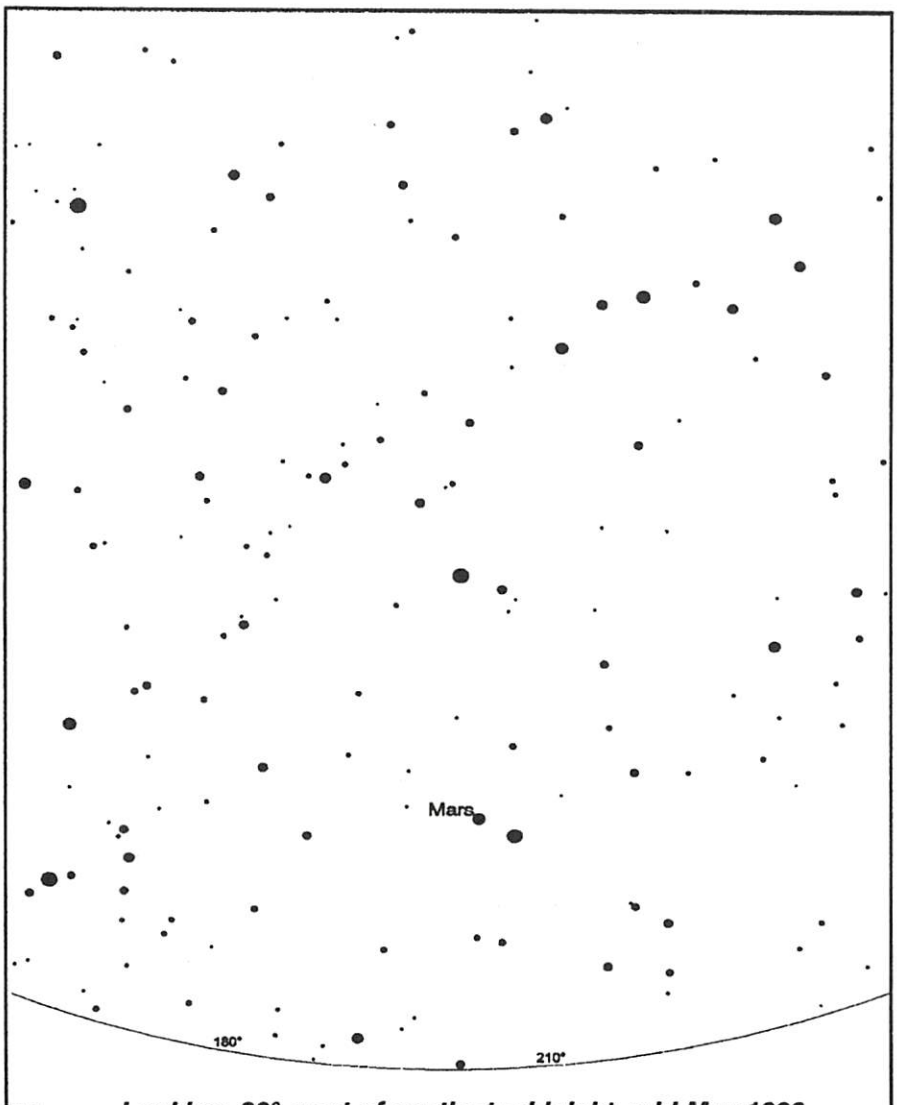
Month	New Moon	First Quarter	Full Moon	Last Quarter
April	16	22	30	8
May	15	22	30	8
June	13	20	28	7

If one continues the arc through Arcturus and so on south through Spica, one finds the small but distinctive irregular quadrilateral of Corvus, the Crow. Faint stars to the west of Corvus are the Cup, Crater, linked with the Crow in mythology.

Arcturus itself is on the tail of a diamond-shaped kite that flies to the north, and to the east of Canes Venatici, forming Boötes, who appears to push the Plough round the Pole endlessly. Immediately east of this diamond shape is the semicircle of the Northern Crown, Corona Borealis, and thence into Hercules. The centre of Hercules is the distinctive "Keystone" shape of four stars, roughly half way between Corona and the bright star Vega which appears near the north east corner of the chart. Finally, just peeping over the horizon just to the east of south are the claws of the Scorpion. The heart of Scorpius is the red giant star Antares, which means Rival of Mars. Spring and Summer will provide plenty of opportunities to compare Mars at its best with nearby Antares to judge how aptly it is named.

Highlights of the events of the quarter include Venus moving deeper into the dark evening sky (watch out for UFO stories!), but sadly the departure of the beautiful evening lineup of Jupiter and Saturn as they move to conjuntion. Mercury sets a little over an hour after the Sun on June 14 and 15, with the extremely young Moon (14 hours) below and to the east on the 14th and alongside Mercury the following evening, with Venus above and to the east. Another photo opportunity?

Richard Knox



Looking 20° west of south at midnight, mid-May 1999