



# GNOMON

Newsletter of the Association for Astronomy Education

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The Royal Astronomical Society*

This enables the newsletter of the Astronomical Society of the Pacific, 'The Universe in the Classroom', to be included as pages 5-8 of this issue.

## EDITORIAL COMMENT

# DOWN WITH PHOTONS!

Astronomers both professional and amateur will support the campaign for clear skies which is claiming world-wide support. How ironic it is that, just when astronomy has formally entered the curriculum, the dark skies necessary for its study are being eroded by light blazing its way upwards from streetlights and other sources. We are pleased to publicise the campaign, details of which will be found in this issue of Gnomon.

\* \* \*

There will be another National Astronomy Week (the fourth) in September 1996. The AAE will be represented on the co-ordinating committee. The Chairman will be Dr. John Mason.

\* \* \*

What is this photograph?

*Hint:* It is not only the Moon that exhibits phases.

Answer in the next Gnomon, but if you can't wait till then, send a SAE to the Editor for the solution.



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There will generally be a 10% discount to AAE members on all publications and advertising rates.

Practising teachers may claim their subscriptions as an allowance against income tax, thereby effectively reducing their contributions.

### Addresses for Correspondence:

**Secretary:** Eva Hans, The Planetarium, South Tyneside College, St. George's Avenue, South Shields, Tyne and Wear NE34 6ET - for all general enquiries. (Tel: 091 4560403, ext. 477)

**Treasurer and Membership Secretary:** Bob Kibble, 34 Acland Crescent, Denmark Hill, London SE5 8EQ (Tel: 071-274 0530) - for all financial and subscription enquiries.

**Editor:** Eric Zucker, 35 Gundreda Road, Lewes, East Sussex BN7 1PT - for all enquiries concerning the Newsletter. (Tel 0273 474347)

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The prices are for *one* issue. A 25% reduction is made for advertising in all four issues.

# SPACE TRAIL

by Robin Gorman

Space Trail is just a few minutes drive from Hampshire Astronomical Group's Observatory. It is located at the Queen Elizabeth Country Park (QECP) which is 15 miles north of Portsmouth, 4 miles south of Petersfield on the A3 in South-East Hampshire. The park is jointly owned and administered by Hampshire County Council (Recreation) and The Forestry Commission (Forest Enterprise). The park's 600 hectares (1500 acres) offers schools a safe environment in which to undertake outdoor classroom studies which include forest walks, a nature trail, wool-based and craft activities, park and conservation management. The park centre contains a book and gift shop, a small video theatre and café. A forest drive leads a mile into the forest, beyond the park centre and links with numerous grassy picnic glades.

Space Trail is in fact the third such trail over the past 12 years starting with a solar system trail in 1981 to coincide with the first National Astronomy Week (originated by the author of this article). The layout was devised by Hampshire Astronomical Group and installed by QECP staff. The second Halley Comet trail in 1985 used location year-posts to indicate the comet's position during its 76-year journey through the solar system.

The present space trail was launched in 1992 with the needs of the national curriculum very much in mind. Guided school visits are now of special prominence and are becoming increasingly popular as the trail becomes a permanent feature. A space trail booklet is sponsored by a locally-based space company Matra Marconi Space, of Portsmouth.

Space Trail is believed to be the largest scale layout of the solar system in use in the British Isles. For entirely practical reasons it is necessary to use two different scales. The body scale is 1:500,000,000 or 1 millimetre = 500 kilometres and the mean distance scale is 1:2,000,000,000 or 1 metre = 2 million kilometres. This scale arrangement works very well with a sensible Sun diameter of 2.8m, Earth of 25mm, Jupiter 284mm and Pluto 5mm.

The distance from the Sun to Earth is just 75m and to Pluto 2,900m. The difference in scale is explained to the children and they are quite happy that the distance to Pluto is only about 2 miles! The trail route is marked out with posts topped with a rocket outline. Visitors are informed that when walking the space trail at normal pace the speed at which they travel is equivalent to a space ship moving at seven times the speed of light!

The Sun is located on the park centre patio and is very eye-catching to visitors, with sunspots randomly dotted on its large orange/yellow disc. A warning is given of the danger to eyesight of looking directly at the sun. The level at which various concepts are dealt with is varied to the children's age and ability; it is often possible to mention the composition of the Sun and the role of gravity in the process.

The planets are painted on boards by a professional artist (showing a comparison Earth size). A spacecraft is shown on all except Pluto to indicate the present extent of space exploration. The inner planets take less than a minute to reach and our spaceship is placed in orbit whilst specific information is given at each stop.

On reaching the Earth/Moon system special attention is given to questioning the children on the necessary ingredients to support life. The role of the Moon (size and composition) is explained.

Mars is the last of the closely-spaced planets but just beyond can be found the first close-up image of an asteroid-gaspra. This provides an opportunity to let the children handle and examine a real meteorite of possible similar origin.

After several minutes walking through the beautiful natural parkland, Jupiter is reached showing its great red spot and four galilean satellites.

Some 320m further finds Saturn with its intricate ring system and large satellite Titan. Adders have often been glimpsed near here- renamed space serpents. The children then unexpectedly arrive at Halley's Comet which is moved each year to its current position some 1300m from the Sun. This is a good time to inform them that when they are in their seventies in 2061 they should try to make a sighting and remember the school visit in the 1990s.

Just around the corner can be found Uranus with its thin ring system. The story of its discovery by William Herschel in Bath using his home made telescope fascinates the children, particularly as it doubled the known size of the solar system overnight.

It is from this point onwards that Space Trail really comes into its own as the huge distances between the outer planets become daunting and more obvious. This is amplified by the trail taking a distinctly uphill route and a great deal of puffing is heard as they pass Neptune at 2250 million miles and reach Pluto. Many Butterflies and occasional Rabbits and Deer can be seen along this path.

The view back to the Sun is discussed and they are reminded that Pluto is very cold and daytime is only a little brighter than with the full Moon on Earth.

This is the end of the Space Trail but it is a chance to mention that if they cared to walk for a further 12,000 miles for over six months, they would arrive in Australia, which on this scale is the distance to the nearest star to our Sun. Just one mile taking a short cut brings them back to the park centre and very welcome rest and refreshments.

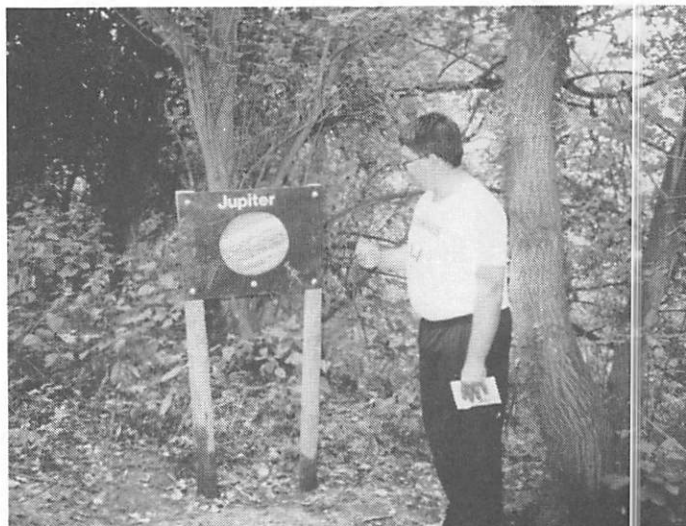
The Space Trail has been very well received by schools, and teachers have found it an excellent way of dealing with very difficult concepts.

Robin Gorman

President Hampshire Astronomical Group

Tel: 0705 595142.

A similar article (letter) to Robin Gorman's was received from Nik Steggall, who provided one of the photographs below.



# REPORT FROM THE AGM ON SATURDAY 15 MAY 1993

This year's Annual General Meeting was held in the University of Leicester. The morning was taken up with the business meeting. The President, Julian Ravest, emphasised our links with other groups, especially UKSEDS who had joined with us in organising the afternoon's events. We also work together with the FAS, RAS, ESTA, and the ASE, assisting each other in providing educational resources and gaining a mutual insight into each other's activities.

Julian also celebrated the success of our "Earth and Space" packs as resources for teachers, especially the Primary Pack which has sold almost 10,000 copies. This is now due for revision.

The meeting then heard the annual reports from the Secretary and the Treasurer, the latter report being read by Bob Kibble who was acting treasurer at the time. Following this the elections to Council were held. A full list of the new Council will be given elsewhere.

**Charitable Status:** For some years the AAE has considered applying for charitable status. Bob Kibble presented the recommendations of Council on this matter to the meeting. The advantages were discussed, and it was felt that they strongly

outweighed the extra administrative load that would be required. It was therefore proposed that we make an application to the Charities Commission, and this motion was passed unanimously. If our application is accepted, then a change in AAE constitution will be necessary. (The exact wording of this appeared in the Spring issue of Gnomon).

A very pleasant lunch was enjoyed in a nearby hostelry.

**The AAE-UKSEDS Afternoon Workshops:** We were joined by a number of visitors for the afternoon activities. These included teachers workshops for Key Stages 3 and 4, planetarium presentations by Alex Lovell, a lecture/slide presentation by Dave Cawley of Timestep Electronics Ltd. on "Weather Satellites" and an excellent talk by Squadron Leader David Clarke on "Satellites and Orbits". Robert Mills also showed us some of his display material on "Stonehenge and the Stars". Our thanks go to all these people who made the afternoon a very lively and interesting experience for everyone.

Special thanks go to Prof Ken Pounds, for allowing us to use the Department of Physics and Astronomy for the meeting, and to Alex Lovell for making all the necessary local arrangements.

*Dr. Anne Cohen.*

## BLINDED BY THE LIGHT . . .

Everybody who is involved in teaching astronomy will have been glad to see the "Wider Universe" incorporated into the material required to be taught in the Science National Curriculum. At first in AT16, then later AT4, the requirements meant that for the first time all our children would be looking at the sky and appreciating the cosmos outside our small planet...or would they?

The phenomenon of **light pollution**, as the urban sky-glow which is wiping out our night skies is known, seems not to have been noticed by the DfE. In their Key Stage 3 Science pilot paper of 1992, the question was asked: "If you look at the sky on a clear night, you could see any of the following: galaxies, moons, nebulae, planets, satellites, stars. Tick the three that are outside the solar system". Leaving aside the debate about what is a moon and what is a satellite, it is obvious that the author of the paper has never tried to look at the sky from a town.

For the first time in history, we are requiring our children to look outside their own planet - an activity of immense educational and philosophical value; and for the first time in human history, the majority of human beings on the Earth are denied the chance to view their heritage by ill-directed lights. We should all be making a noise about this.

Further information from: **BOB MIZON:**



### BRITISH ASTRONOMICAL ASSOCIATION CAMPAIGN FOR DARK SKIES

*A Joint commission of the BAA and IDA*

Sky-glow, or light pollution as it has become known, now invades the night sky over most of the United Kingdom. A BAA survey shows that more than 90% of observers suffer from the effects of sky-glow, most of it the result of wasteful, ill-directed lighting.

The BAA's Campaign for Dark Skies (CfDS) was set up in early 1990. Its aim is to bring the issue of light pollution to the attention of the public, the Government and the lighting industry.

#### **CfDS wants to see:**

- ★ Modern full-cut-off light fittings in general use.
- ★ The right amount of light for the task, not wasteful overlighting.
- ★ Controls on floodlighting of buildings, sports grounds and the like, to minimise upward leakage.
- ★ Wider use of infra-red-triggered security lighting, a far better deterrent than continuous glare.

#### **CfDS recognises that:**

- ★ Astronomers have the same lighting needs as everyone else. They do **not** want to see all street lights turned off, but

require **good quality** lighting which illuminates where needed.

- ★ Minimising light pollution saves precious energy resources. The amount of greenhouse gases released into the environment by power stations can be reduced.
- ★ Well designed light sources emit little or no light above the horizontal. Unshielded lights may, depending on the design, emit up to 80% of their output above the horizontal.
- ★ Glare, as motorists know too well, is another result of poorly shielded lights.

#### **Major achievements of the Campaign to date (early 1993) include:**

- ★ The favourable reaction of the Institution of Lighting Engineers to our approaches, culminating in the issuing of ILE guidelines on the reduction of light pollution in mid-1992.
- ★ The heightened awareness of the problem among lighting engineers and in the lighting industry, whose literature now regularly mentions light pollution.
- ★ Collaboration with the National Remote Sensing Centre, Farnborough, to produce and publicise the first large-scale satellite image of Britain's night time energy wastage.
- ★ Consultation with the British Standards Institution leading to new clauses on obtrusive light and sky-glow in BS 5498 in July 1992.
- ★ The treatment of the subject by ITN including an appearance by Environment Minister David Maclean who spoke in support of reversing the trend of light pollution.

In addition to raising the issue with councils, surveyors, lighting engineers, the general public and the media, CfDS has corresponded or met with representatives of the following organisations.

The International Dark Skies Association (IDA); the International Astronomical Union (IAU); the Commission Internationale de l'Eclairage (CIE); the Institution of Lighting Engineers (ILE); the Department of the Environment; the Department of Energy; the Department of Transport; J. Sainsbury Development Division; Safeway PLC; the British Parliamentary Lighting Group; the Campaign for the Protection of Rural England; British Rail; the Chartered Institution of Building Service Engineers (CIBSE) . . . and many others.

The Campaign for Dark Skies believes that the control of light pollution to preserve our heritage above is an idea whose time has come. In an era when the environment, energy considerations and the surge in discoveries about the Universe are matters of everyday discussion, it makes sense to confront the problem.

For further information on CfDS, write to: Bob Mizon, Co-ordinator, BAA Campaign for Dark Skies, 38 The Vineries, Colehill, Wimborne, Dorset BH21 2PX.

# FALLING STARS, BUT FEW PLANETS

by Roger O'Brien

Autumn is the season of mists and mellow fruitfulness and lengthening nights. In summer, astronomical twilight lasts from sunset to sunrise, but longer nights should be darker nights. This year we are not going to get a brilliant show of autumn planets because most of the planets are on the daylight side of sky. Saturn lurks in Aquarius (my birthsign and one of the least distinguished constellations in the sky). You can try picking out Uranus and Neptune in Sagittarius, if you have a good southern aspect, a telescope and a lot of persistence. Those able to get down to 13th magnitude can look for Pluto, which is lurking on the borders of Virgo and Ophiuchus. Until the end of this century, Pluto is only the second most distant planet from the Sun. Neptune is always roughly the same distance from the Sun, but Pluto's orbit is markedly eccentric (i.e. not even approximately circular) and it gets closer to the Sun than Neptune for about 20 years out of the 248 it takes to go once around the Sun. As the season goes on, the Zodiac steepens its angle with the horizon from nearly flat along the south in summer to a high arch in winter. It is a great pity that the brightest zodiacal constellations - Sagittarius and Scorpio - are summer constellations and never well seen from Britain; indeed, parts of them are below the southern horizon, as you will see from the first illustration (see note at end).

As usual, I will just mention my favourite M31 - the galaxy in Andromeda - the most distant object clearly visible to the naked eye. Actually you need good conditions (no artificial lights, clear sky) to catch sight of this galaxy without aid, but even modest binoculars pick it up well. Not too far away, there is another galaxy - M33 in Triangulum. In astronomical terms, M33 is genuinely quite close both to us and to M31. Compared with M31, M33 is a much harder object to find. M31 is generally reckoned to be just under 6th magnitude and M33 just over. M33 is almost face on to us and has a relatively low surface brightness. However, it is a large object with an angular size comparable to the full Moon.

The first problem is to find Triangulum itself. Three not very bright stars form a very narrow isosceles triangle pointing approximately south-east. The point of the triangle and the position of M31 give you a line to search along (see the second diagram). M33 is a dim, round, blurry patch, just a fraction brighter than the background. It is a spiral galaxy, probably about the same size as the Milky Way, with a small nucleus and rich, splayed arms, but you will get very little impression of this detail unless you can take a long exposure photograph with

a pretty large telescope.

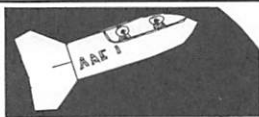
I've always liked looking at M31 and trying to find M33. Sometimes I find it and sometimes I don't. We are very lucky to be in the Local Group (of galaxies), which contains three large spiral galaxies and lots of smaller ones. Our Milky Way has two companions (the Magellanic Clouds) and so does Andromeda, which raises the immediate galactic population to seven. Actually, the Local Group is quite rich. It is a satellite of a much larger grouping of galaxies - the Virgo Cluster.

I know that not everyone likes galaxies and this autumn's planetary astronomy is bound to be disappointing so I would like to direct your attention to meteors. Most people seem to consider the Perseids the best and most reliable meteor shower of the year. They were due on August 12th. October 22 should see the peak of the Orionid shower, which has fast meteors and the maximum lasts for some hours. Of course, Orion will be low on the eastern horizon in the evening. This could be an advantage, since those bright, fast meteors will fan out all across the sky. I do hope it is clear. The Moon will be at first quarter and, fortunately, low on the western horizon.

The Taurids follow on November 3rd and the Leonids do the same on 17th December. In December the best bet will be the Geminids, which reach their maximum rate at 10pm on the night of 13th. Gemini will be riding high at that time in the winter night sky. For this shower the Moon will be new!

Sporadic meteors are small particles of dust that burn up in the Earth's upper atmosphere. They come in from more or less any direction and vary enormously in speed, brightness, and colour. Shower meteors work in the same way (i.e. becoming visible by burning up in our atmosphere), but they travel in great swarms. The swarms, in most cases, follow the same orbits as known comets, but the dust grains are distributed all around the orbit in varying densities and spread across the main orbital path. When the Earth encounters such a swarm, the meteors plunge towards us in parallel lines. As we look along those parallel lines, perspective makes them appear to diverge from a single point in the sky. This point is called the "radiant". Meteors are supposed to burst out from the radiant like the "stars" from a big firework. You will have guessed that I have never seen this effect; perhaps, my luck will change this year. Meteors are supposed by some to be lucky for the observer.

Roger has produced three relevant star charts. Readers who would like copies should contact him directly (23 Summerhill Road, South Tottenham, London, N15 4HF.)



## SPACE - LINK

By Nik Stegall

### HOW THE ROCKET OPERATES

A rocket engine develops push (known as thrust) in the following way: Hot gases created by the burning of propellant press on the walls of the combustion chamber. If the chamber were a complete enclosure, these pressures would be balanced in all directions. But the rear of the chamber narrows to a nozzle design to permit the gases to escape. This exhaust flow prevents internal balance: pressure on the chamber wall opposite the nozzle, plus some pressure on the nozzle walls, pushes the rocket forward (or alternatively, from the principle of conservation of momentum, there is a reactive thrust on the rocket).

The rocket combustion chamber serves to convert the propellant mass from a solid or liquid to a high-temperature gas. This is similar to the action within a car engine, except that in the car engine the spark must be continuously supplied to effect ignition of the fuel/air mixture. In a rocket, ignition is sustained by the constant supply of heat from the burning gases.

After combustion the high-temperature, high-pressure gases are channelled through a throat and nozzle to produce a supersonic (greater than the speed of sound) exhaust jet.

A rocket needs nothing to push against. All pushing occurs

internally: therefore the exhaust merely releases the brakes on combustion forces. The greater the exhaust speed, the greater the internal push.

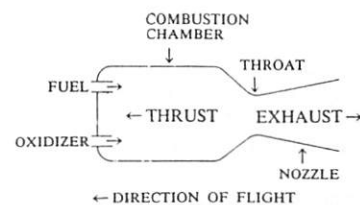


Figure 1. Rocket Action.

### TRY THIS EXPERIMENT

Rocket thrust can be likened to the action of a toy balloon set free after it has been inflated. Compressed air inside the balloon behaves in the same manner as hot combustion gas in a rocket. When the air is allowed to rush out of the neck of the balloon, the unbalanced internal pressure send the balloon soaring in the opposite direction.

The flight path of the balloon after it has been released will be erratic. To control the path of the balloon and also to find out how far the balloon will travel you can try this second experiment.

First find an area where you can tie a length of cotton at a

*Continued on page 9*

convenient height from one end of the classroom to the other. Before tying the second end of the cotton, thread the cotton through a drinking straw. The straw will provide the flight path of the balloon. When this has been completed inflate your balloon (a sausage shaped balloon is the best shape for this), tape the balloon to the straw. Let go of the neck of the balloon and see what happens. What happens to balloons with other shapes? How far do they go? How quickly do they travel? See Fig.2.



Fig. 2.

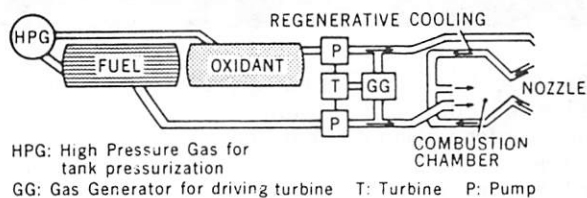
### A SIMPLE LIQUID PROPELLANT ROCKET

In this case we will take a rocket which uses liquid oxygen as the oxidant, the air and kerosene as the fuel.

The liquid oxygen is directly pumped to the combustion chamber and is also used to drive a pump turbine. Pumping is necessary due to the large amount of fuel consumed by large rocket engine. The 5 engines of the Apollo Saturn V rocket for example used 12 tonnes of fuel per second.

The kerosene fuel is pumped along a very long path around the nozzle before entering the combustion chamber. There are two reasons for this. Firstly, the hot gases which flow through the nozzle at very high temperatures (typically 3,000°C) could destroy the material of the nozzle very quickly unless some form of cooling was employed. The kerosene, flowing through the tubes round the nozzle, performs this function which is called regenerative cooling. The second reason is to pre-heat the kerosene to speed up vapourisation before burning in the

combustion chamber. See Fig.3.



HPG: High Pressure Gas for tank pressurization  
GG: Gas Generator for driving turbine T: Turbine P: Pump

Fig. 3. A simple liquid propellant rocket.

### STONEHENGE

Robert Mills organised an astronomy stand at an exhibition on 8 July 1993 held to launch a campaign to improve the public's awareness of this ancient monument (full details were given in the last issue of Gnomon). The photograph shows Jocelyn Stevens, Chairman of English Heritage, addressing an audience in a marquee close to the site.



## ASTRONOMY TRAINING DAY

This year's Royal Astronomical Society's "Training the Trainers" **English** conference will be held on Saturday 13 November 1993, at the Bristol Exploratory. By popular request this meeting will focus on astronomy for primary schools, and there will also be the usual open session for wider contributions and discussion. There will be time to enjoy the interactive exhibits at the Exploratory. There will be a registration fee of £2.50, which includes the entrance fee to the Exploratory itself.

INSET providers and others wishing to attend should write for further details and registration forms to: Dr Margaret Penston, The Royal Greenwich Observatory, Madingley Road, CAMBRIDGE, CB3 0EZ. The closing date for applications is the end of September.

(Please note that places at this conference are again strictly limited to fifty. Applications will be accepted on a first-come-first-served basis). For details of the RAS's **Scottish** "Training the Trainers" conference, see p. 10.

Anne Cohen  
RAS Education Committee

### FUTURE ASTRONOMERS OF EUROPE

The European Southern Observatory is organising a new programme with this title. It is a full international project, with support from the Commission of the European Communities.

The main event of the ESO programme is a series of national

essay contests among school pupils; there is no definite age limit, but the average age of contestants will be from 17 to 18. The subject of all contests is "An Observing Night with the ESO Very Large Telescope". The winners will have a two-week stay at the ESO headquarters at Garching in Germany, including the chance to perform real astronomical observations at the ESO observatory at La Silla in Chile.

I have been asked to act as co-ordinator for the British national committee. The following eminent astronomers have agreed to be involved: Professor Arnold Wolfendale (Astronomer Royal), Professor Sir Francis Graham-Smith, Dr. Derek McNally, Dr. Paul Murdin, Dr. Chris Kitchin, Professor Ken Pounds, Professor Sir Martin Rees, Iain Nicolson, Professor Peter Willmore, Dr. John Zarnecki, Dr. John Mason.

Entries should cover between 5 and 6 pages of A4 paper. The deadline for submission of entries will be 15 October, and no essays received after that date can be considered. The ESO requires the names of the two winners by October 31.

Further information can be provided. If you would like to know more, please send a stamped addressed envelope either to me or to Dr. John Mason, Olympus Mons, 51 Orchard Way, Barnham, Sussex PO22 0HX. Details will also be given in the August edition of the periodical Astronomy Now.

Patrick Moore  
Farthings, West Street, Selsey, Sussex

## FAS Autumn Convention at The Pippard Lecture Theatre, Cavendish Laboratory, Madingley Road, CAMBRIDGE on 25th September 1993

Speaker should include:

Dr. Vivian Moore (Imperial College)  
Dr Bob Lambourne (Open University)

Iain Nicholson (University of Herts)  
Dr. Bob Thomson (University of Cambridge)

Buffet lunches will be available at £4.00 bookable in advance (the restaurant needs to know numbers - it has been good value in the past!) Coffee available. Trade Stands (enquiries to Pam Spence, 4 Marlinespike, Shoreham-By-Sea, West Sussex, BN4 5RD). Admission £3.50 if booked before the day and £4.50 on the door. Access from 9.30 a.m. Ample car parking on the site. The meeting will finish at 6.00 p.m. Visits are to be arranged. Send your remittance to the FAS Treasurer, 27 York Road, Crawley, West Sussex, RH10 5JS.

# LETTERS

Dear Editor,

I have recently re-discovered, in your Autumn '92 edition of *Gnomon*, the instructions for making a Lunar Phases Box. I decided to make it, for a school 'Family Science' event.

There are one of two things which I feel I ought to comment upon -

1) The suggestion of using a golf-ball, however attractive its cratered surface may be, could be dangerous!

Whilst I was cutting holes in the box, my husband went to his workshop to make a hole in the golf-ball. He came back with his hair full of a sticky liquid. Apparently, what had happened was that, whilst drilling a hole in the ball, he had struck 'white gold' as a strong jet of liquid latex had shot out and got him in the head! Fortunately, it missed his face and eyes. It did not, however, miss the wall, ceiling and rows of tools.

I know that the instructions say, "push the ball onto the nail", and children in class are not likely to use an electric drill, but this does raise questions of safety, if parents carry out the project at home.

I have, therefore, re-typed the instructions, leaving out any reference to golf-balls.

2) I found it desirable to cut the torch hole centrally, at one end, with the peep-hole to the left of it. Most people are right-handed, so it is easier to hold the torch in the right hand and use the right eye for viewing, from this end.

3) As we don't buy shoes in boxes, I tried a larger box. I soon found out that a shoe-box is a better size for children to make and use! Bigger is not necessarily better!

As we, the members of the Ballarat Astronomical Society, entertain many

children at the Ballarat Municipal Observatory, I would like to be able to make the instructions available to the public.

Regards to all at AAE, as you gear up for summer and we slide gently into the months of cold, wet weather and a period of more theory than practice.

Yours sincerely

Karenza Burk (Mrs)  
Crawswick, Victoria, Australia.

*Editor's Note:* We got in touch with Teresa Chilton and she informed us that her original plan was to use a ping-pong ball rather than a golf ball.

During the course of its development, somehow or other the golf-ball took over - presumably because of its lunar-like surface, Teresa agrees that it could be dangerous to use a golf-ball, unless the operations were strictly supervised by a reasonable adult who was aware of the dangers.

## LETTER - VERY BRIEF SUMMARY

A letter has been received from Cmdr. L. M. Dougherty which is too long to include in the "Letters" column. The gist of the letter is to take a contrary view of the dangers arising from direct solar observation to those propounded by Merlin Ellis (*Gnomon* 12,3, Spring 1993). Dr. Dougherty argues that the "blink reflex action" - at least in healthy males - which is involuntary and quick, prevents ophthalmic damage.

This is obviously a controversial view, and Dr. Dougherty invites correspondence. For those who wish to make a contribution, the Editor will send a copy of the letter to those interested on receipt of a stamped, addressed envelope (the

editor's address is on page 1).

Two articles on this by Cmdr. Dougherty have been published by the British Astronomical Association:

Dougherty, L. M., *J. Brit. Astron. Assoc.*, 89 (5), 450 (1979).

Dougherty, L. M., *J. Brit. Astron. Assoc.*, 93 (2), 95 (1983)

Dear Editor,

Thank you for the article by Fiona Vincent clarifying the Zone Time issue. But let a maligned Irishman spring to the defence of the UK measure of civil time against the backward looking Scots. In the UK we keep "Universal Time" and have done so since 1928. Greenwich Mean Time has not been in use for somewhere of the order of 65 years! Perhaps, as Fiona suggests, the Irish and the Portuguese should be the guardians of time!

Universal Time is a much grander concept than a local London Borough Time, is it not? However, the uncomfortable truth for such delusions of grandeur is that UT is, in the essentials, GMT by another name plus a shift from midday to midnight to begin the day.

Since 1972 January 01, UT has been distributed as UTC - Coordinated Universal Time. UTC is a "uniform" measure of time differing from International Atomic Time by an integral number of seconds. This number changes (leap seconds) to keep UTC within 0.90 of UT1 - UT1 is the observed universal time corrected for the motion of the geographic pole. It gets complicated, doesn't it?

Yours sincerely

D McNally  
Director, University of London  
Observatory.

## ASTRONOMICAL INSTRUMENTS FROM HELIUS DESIGNS

If you are looking for a telescope and associated equipment, for your school, society or even yourself, you might be interested in the range of instruments from Helios Designs of The White House, Aldington, Evesham, Worcestershire, WR11 5UB (Tel: 0386-830083). They manufacture a range of telescopes from about 8 inch to 16 inch apertures. The 8 inch is an integrated computer drive telescope and costs £975. Helios also produce a range of rigid mountings and computer drives. They are in the final stages of development of a CCD camera system which may be used with any telescope. A future product will be a planetary camera with much higher resolution than the normal CCD; also a solar telescope which will incorporate a spectroheliograph and coronagraph.

Members who are interested should contact Helios Designs at the address above.

### Astronomy Education in Schools "Training the Trainers" Scottish Conference 1993 October 16

Recently the Royal Astronomical Society (RAS) has been instrumental in organising meetings in England to further the Teaching of Astronomy in Schools. It is now planned to run a one day event in Glasgow.

The programme will include/provide:

*General lectures on Astronomy*

*Demonstrations of laboratory and computing pieces for astronomy education*

*A short Planetarium show*

*Discussion of the projects/modules that are currently undertaken in local schools*

*A forum to air the experiences and needs of teachers (Primary and Secondary).*

The Meeting is scheduled for Saturday 16 October and will run between 10-00 and 17-00. Depending on the number of participants, it will be held entirely in the University Observatory or within the University Campus with the demonstrations and planetarium show at the Observatory later in the afternoon. A Registration Fee in the range of £5.00 to £10.00 is envisaged to cover the cost of a Buffet Lunch, Tea/Coffee, Local Transport (between Campus and Observatory if necessary) and Documentation.

In order to gauge the response for the required accommodation, I should be pleased if you would register your interest in attending the Meeting by contacting me at the address below. If you wish to contribute to the Meeting or you require further information, please contact me by phone or letter.

I look forward to organising what should be a useful and informative event.

Dr David Clarke, Meeting Organiser (Astronomy in Schools), University of Glasgow, Department of Physics and Astronomy, Acre Road, Glasgow, G20 0TL (Tel: 041-946 5213). See p. 9 for details of the English conference.



# CURRICULUM CORNER

Compiled by

Bob Kibble

This part of Curriculum Corner is designed to give readers an insight into astronomy in Primary school. It might be helpful to any FAS members contemplating making their first excursion into supporting school astronomy.

I have had a number of enquiries following my presentation at the FAS convention at Coventry earlier this year. The most common question is 'What can I or my society do to help schools?' There are two avenues through which to approach this question, depending on the society's accommodation and availability of confident speakers.

1. If you have an observatory which could seat a dozen or so visitors you could hold an evening event. This could be targeted at families (advertise in the local free press or community centre, church, library etc) or teachers (contact the local authority science adviser/inspector or branch of the Association for Science Education: the ASE HQ is at College Lane, Hatfield, Herts) or scout club etc. Have friends bring binoculars/telescopes to help out and have a short talk or slides available should the weather be against you. It is unlikely that the offer of an evening session will be taken up by a class teacher in a primary school. Night time events are not suitable for young children particularly as they would need to be accompanied and would need to travel an untried journey.

2. If you have members who are confident and available during school hours you could contact a local school or again a science advisory teacher. Let them know the range of services you could provide e.g. slide show, how a telescope works, the sky tonight, etc and agree on a date, time, venue and duration. Remember that an artefact or two will help to focus attention but some stimulating questions (Who has seen a shooting star? Which is the coldest planet?) can help start a question and answer session which could go on and on. Remember to try to involve everyone in your questions, not just the three keenies at the front, and include the teachers. Schools are keen to promote equality of opportunity so avoid constant references to this and perhaps use the subject to illustrate the cross-cultural and international nature of astronomy, Arabic star names, Greek legends, Russian space probes, Australian observatories, Italian pioneers etc.

Last month I was invited to give a talk to year 4 pupils (aged 8/9) at Selsdon Primary school in Croydon. My brief was to talk about what to see in the night sky. Seventy five pupils greeted me warmly in the school hall and their questions helped to maintain a furious pace throughout the hour. My slides, socks and telescope also helped. I'll say no more about the talk but have included some examples of pupil's work following the talk. I hope it gives members a feel for what interests pupils and how they approach ideas from astronomy. I keep all these letters in a 'fuzzy file'. When I feel down and need a pick-me-up I read through the file.

See more details when you go out to look at the stars tell an adult where you are going. Remember when you go outside to put on your socks, hat, trousers, jumper or a jacket and get out your garden chair.



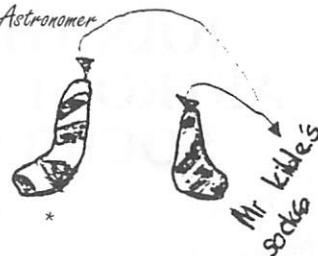
Dear Mr Kibble,

Thank you for coming in and showing us how to become an astronomer. I enjoyed hearing about astronomy. I thought the pictures and photos were very interesting I have not been out in my garden at night yet, but I have seen a satellite. Another night I stayed up til half past two am, but only saw the moon. This was all done looking out of a window.

Yours sincerely  
Adam Norris

How to be an Astronomer

Mr Kibble came into school to teach us how to be an astronomer. He started by telling us about what he did first he told us about how he put on an extra pair of socks.



\* \* \*

Dear Mr Kibble,

Thank you for coming to our school and teaching us about space. I enjoyed your slides. You made me want to spend time looking at the stars. I hope you will be able to come again.

Yours sincerely,  
Ronnie Wild.

\* \* \*

Dear Mr Kibble,

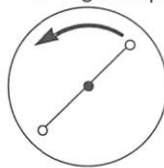
Thank you for talking about astronomy I found it interesting about all the clothes you have to where. I didn't know that on August the 12th there will be shooting stars I will deffentley be in the garden. Albert Einstein must be very clever by inventing the telescope you had.

Yours sincerely  
Richard McKilvey.

\* \* \*

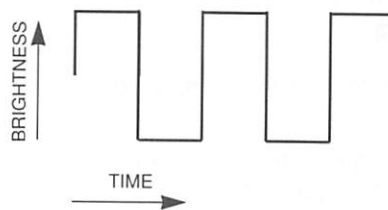
## MAKE YOUR OWN BINARY STAR

Here's something to think about which may be the basis of a DIY double star system. I played around with a mock-up some-time ago, and it needs refining. What we need is a pair of torch bulbs, each representing a star. Either use separate batteries, or the same battery for both stars (that is in parallel). We also need a gramophone turntable capable of being rotated about its centre (see diagram) - this could even be done manually. Each star eclipses (occult) the other in turn as the table is rotated, when viewed from a distance, in a dark room, the doublestar system "winks" as one star eclipses the other. The set-up is more realistic if the torch bulbs are enclosed inside ping-pong balls, and also if the stars are of different brightnesses. With a bit of ingenuity, a light-sensitive detector such as a photodiode could be used to plot the light curve of this simulated eclipsing system (a real life example of which is Algol).



EYE

E.Zucker



## MEMBERS' ADVERTISEMENTS

These are free as long as they are of reasonable length. **FOR SALE** (message received over the phone: there may be errors). 10" F/4.3 deluxe Newtonian, made by Astro Instruments, with 5 eyepieces. R.A drive. Also Genesis 6" F/5-refractor, with case and altazimuth tripod. Celestron 45° image erector 5 eyepieces. No longer needed owing to ill-health. Each cost £1,600 two years ago. Any reasonable offer accepted. R.Y.Hobbs, 2 Amherst Close, Hastings, East Sussex, TN34 1TY.

# JOIN THE ASTRO SPACE SOCIETY

*This item was sent in by Nik Steggall.*

Readers interested in membership of the Astro Space Stamps Society may request a 'Satellites' - wall-chart supplied gratis on a first come first served basis. Envelopes must measure at least 9 inches x 6 inches (stamped addressed envelopes please from UK-Readers, also two international reply-coupons and self-addressed-reply envelopes from overseas Readers please). The offer is limited to one per household. All enquiries to: Astro Space Stamp Society, Public Relations Unit, 20 Princes Park Avenue, Golders Green, London, NW11 0JP.

Readers mentioning this announcement in 'STAMP & COIN MART' when writing will receive souvenir USA space museum leaflet or 1992 / CANADA in space souvenir-card.

## COMPETITION

The British National Space Centre and The Neil Armstrong Space Museum have kindly donated the following prizes:

- A British National Space Centre / European Space Agency first day covers - April 23 1991
- B British Industry in Space 92 / International Space Year 92 commemorative-covers - April 7 1992
- C NASA - Space-Shuttle-Erasers
- D Neil Armstrong Air & Space Museum Personalised Pencils-Erasers.

*Just answer the following Competition Questions:-*

- 1 Name the 12 moon-walkers and name their space-missions.
- 2 Correctly state the dates of these space-missions.
- 3 State total-time spent walking or riding on the moon.

Readers should type or print answers, names, addresses, ages if under 21, and the name of their School, College or University.

Completed entries should be sent to ASTRO SPACE STAMP SOCIETY, Moon-walking Competition, Honorary PR Dept, 20 Princes Park Avenue, Golders Green, LONDON, NW11 0JP.

## Sky Diary Summer 1993

*By Eva Hans*

Equinox :	Sept	23 <sup>d</sup>	00 <sup>h</sup>	22 <sup>m</sup>
Solstice :	Dec	21 <sup>d</sup>	20 <sup>h</sup>	26 <sup>m</sup>

### MOON

New Moon	First Quarter	Full Moon	Last Quarter
Oct 15 <sup>d</sup> 11 <sup>h</sup> 36 <sup>m</sup>	Oct 22 <sup>d</sup> 08 <sup>h</sup> 52 <sup>m</sup>	Sept 30 <sup>d</sup> 18 <sup>h</sup> 54 <sup>m</sup>	Oct 08 <sup>d</sup> 19 <sup>h</sup> 35 <sup>m</sup>
Nov 13 <sup>d</sup> 21 <sup>h</sup> 34 <sup>m</sup>	Nov 21 <sup>d</sup> 02 <sup>h</sup> 03 <sup>m</sup>	Oct 30 <sup>d</sup> 12 <sup>h</sup> 38 <sup>m</sup>	Nov 07 <sup>d</sup> 06 <sup>h</sup> 36 <sup>m</sup>
Dec 13 <sup>d</sup> 09 <sup>h</sup> 27 <sup>m</sup>	Dec 20 <sup>d</sup> 22 <sup>h</sup> 26 <sup>m</sup>	Nov 29 <sup>d</sup> 06 <sup>h</sup> 31 <sup>m</sup>	Dec 06 <sup>d</sup> 15 <sup>h</sup> 49 <sup>m</sup>

### MERCURY

Mercury is in the evening sky until October 31st. It then reappears as a morning object from November 12th to December 18th.

### VENUS

Venus can be seen in the morning sky until the beginning of December.

### MARS

Mars is an evening object until early November.

### JUPITER

Jupiter is visible in the evening sky during late September and early October. It then becomes too close to the Sun to be seen. It reappears in the morning sky from early November.

### SATURN

Saturn is an evening object moving through Capricornus and into Aquarius by late December.

### ECLIPSES

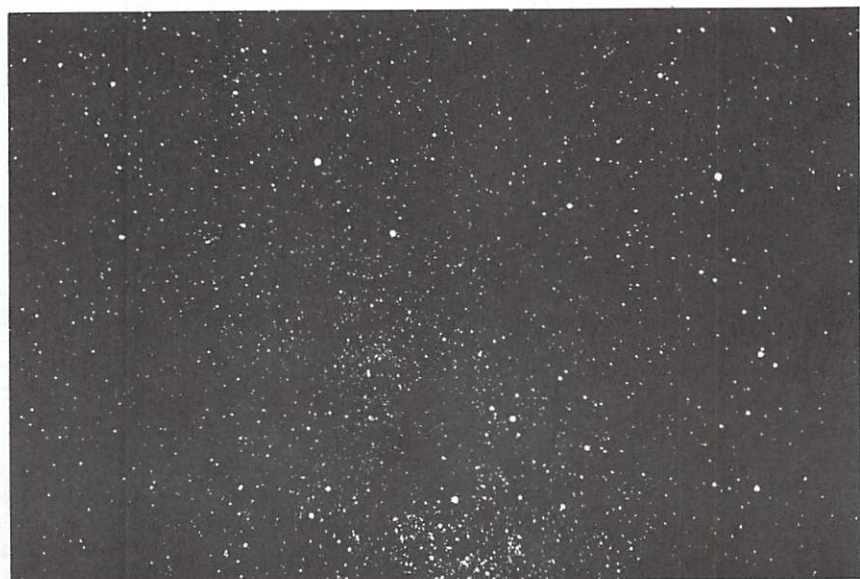
Two eclipses occur in November 1993. A partial eclipse of the Sun takes place on November 13th but this is visible only from New Zealand, South Australia, Antarctica and the southern tip of South America. On November 29th there is a total eclipse of the moon. This one is visible from the UK.

Moon enters penumbra	November	29 <sup>d</sup>	3 <sup>h</sup>	27.1 <sup>m</sup>
Moon enters umbra			4 <sup>h</sup>	40.4 <sup>m</sup>
Moon enters totality			6 <sup>h</sup>	02.2 <sup>m</sup>
Middle of eclipse			6 <sup>h</sup>	26.1 <sup>m</sup>
Moon leaves totality			6 <sup>h</sup>	50.1 <sup>m</sup>
Moon leaves umbra			8 <sup>h</sup>	11.9 <sup>m</sup>
Moon leaves penumbra			9 <sup>h</sup>	25.0 <sup>m</sup>

Note: all times are given in UT which is approximately the same as GMT.

*You have to be in the southern hemisphere if you want to see the Southern Cross. Here is a fascinating photograph of that constellation, taken by Karenza Burk, using a tripod and 1600 150 film.*

*Members' photographs are always considered for publication (contact the editor).*



SOUTHERN CROSS AND POINTERS

Photo: K. Burk (Tripod, 1600 150)