



GNOMON

Newsletter of the Association for Astronomy Education

Vol. 10 No. 4

ISSN 0952-326X

SUMMER 1991

*This issue of 'Gnomon' has been sponsored by
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 3-6 of this issue.

How Widely and Well is Astronomy Taught?

by Donald Gold, former HMI and a past President of AAE

Many schools in this country are, to be frank, floundering as far as teaching astronomy is concerned.

Although astronomy is now part of the science curriculum, it appears that only a small percentage of schools are really engaged in teaching it. The fault is not necessarily theirs but the result of a combination of circumstances.

This is the main finding of a survey which AAE carried out in 259 schools in Berkshire at the end of 1990 and the beginning of 1991. The County Council of Berkshire agreed to circulate a questionnaire, prepared by AAE, to its schools and the replies were processed by Donald Gold, a Vice President of AAE.

It is difficult to say how representative Berkshire is of the country as a whole, but there are certainly variations of affluence and non-affluence within its boundaries.

Low Priority

Of the 17% of Primary schools and 23% of Secondary schools which replied, it was disturbing to note that many schools gave a low priority to the teaching of astronomy. The explanation was a lack of resources, including a lack of teachers who could teach the subject, an already over-crowded curriculum, and a division of opinion of what sort of astronomy could be taught to children of various ages.

Schools were about equally divided between treating astronomy as thematic or cross-curriculum material, and as part of the science curriculum. Only two included astronomy as part of the geography curriculum.

Shortage of Teachers and Resources

In-service training did not feature in the replies. Most schools did not include astronomy in their regular Inset programme. Comment made by schools was that the difficulties experienced in

finding teachers who could teach the subject, lack of resources and so on, accounted for this. A few schools had sent teachers to visit the Old Royal Observatory, Greenwich, and the Science Museum, South Kensington, to learn for themselves. Few schools made any arrangements for observing the night sky; but where this did occur it was due to parents' interest.

It is not surprising that few made use of published schemes of work. Some referred to the School Library Service as a source of knowledge and a variety of books such as 'The Young Scientist Investigates', 'Active Science', 'Salters starting Science', but they were not numerous.

No information was available from schools on the GCSE examination in astronomy; a few were considering it but plans went no further than this.

Help Badly Needed

It was clear that most schools were looking for help in approaching the teaching of astronomy.

Most of those schools which replied to the questionnaire were looking to the AAE for support in arranging Inset events and in producing a teaching scheme. Many schools hoped that AAE would help in producing pupil worksheets and a video or slide sets.

Among suggestions made in this area was the possible loan of materials and visual aids, and case studies of successful teaching of the subject.

Indeed, the earlier comment that schools appeared to be floundering in their approach to teaching astronomy is justified from most points of view. The overall picture is certainly disturbing, but the clear message that came across was that help is badly needed if schools are going to develop the teaching of astronomy. The Association for Astronomy Education has a crucial and immediate part to play.

Editorial Comments

Responding to requests that the AAE Annual Meeting be held away from London this year, the Council decided that the meeting be held in South Shields, Tyne & Wear. To those for whom 'north of Watford' implies a deep penetration into uncharted territory, it comes as a surprise that a very civilised and sophisticated population actually lives in these remote areas. Thanks are due to Eva Hans of South Tyneside College for being the 'on-the-spot' organiser; delegates enjoyed a planetarium show and a visit to the college's 16-inch Cassegrain telescope. A pub lunch facing the intriguing Marsden Rock bird sanctuary provided a welcome break.

Very few people at the meeting seemed to be aware of the important astronomical 'shrine' at Harton Pit, just one mile south of the college. It was here, in 1856, that George Airy, the Astronomer Royal, performed his classic experiment to determine the mean density of the Earth, by timing the oscillation of a pendulum at the top and at the bottom of this 1000 ft deep coal mine, obtaining the surprisingly accurate value of 6.565 grams per cubic centimetre. Unfortunately, a modern leisure centre seems to have been built over the pit.

• • •

Would any artistically disposed Member offer his or her services by providing a regular cartoon for *Gnomon*? There are four issues per year. The cartoons should have an AAE flavour and be capable of reduction to a 2" x 2" size. Those interested should contact the Editor.

BRITISH PLANETARIUM ASSOCIATION

Undine Concannon, Administrator of the London Planetarium, will represent the British Planetaria at the next meeting of the International Planetarium Society in June. A report will be given in the September issue of *Gnomon*.

A new London Planetarium show, 'Space Trail', will lift off at the Planetarium in June. There will be a giant rotating Earth circled by four satellites, live weather transmissions and pictures from the Hubble Space Telescope.

CONGRATULATIONS to Martin Ratcliffe on taking up his appointment as Director of the Pittsburgh Planetarium. Martin was previously Deputy Director of the Armagh Planetarium and was the BAA representative on the AAE Council.

PRESIDENTIAL ADDRESS TO THE AGM

You will be hearing in due course today of the details of our activities during the year from our Secretary and Treasurer. I would like to set the scene by dealing with more general issues.

The Association was founded some ten years ago to act as a forum for the promotion of, and support to, astronomical education in schools and amongst the general public. We are not concerned with tertiary education as such. There were, and are, a number of other astronomical societies, all of whom have some interest in education, but for none is education their prime concern.

It is our prime concern.

Over the ten years there have been changes in the educational system, in particular the advent of the National Curriculum with its astronomical content, to which we have made a significant contribution. But our work is not finished, we continue to have a vital role as a focal point for knowledge and experience of astronomy education, as an advocate for the importance of astronomy as a component in the science curriculum at all ages, and through our support to the teaching of astronomy in the classroom.

Astronomy is a key element in science education. Children are excited by it. It is important in its own right, for everyone should have some understanding of the world and universe in which we live. It is also a powerful vehicle for the teaching of so many other scientific topics. Its cross curricula potential is enormous and still remains largely untapped.

Science teaching, with astronomy, is crucially important in our country's, indeed for our civilisation's, well-being. Only five life-times separate us from the time of Galileo: and it has been science and technology, more than any other force, that has driven progress since that time. Economic well-being is dependent on the provision of a skilled body of

scientists and engineers and a scientifically literate management. It is no coincidence that Japan has more scientists and engineers than Britain, France, Germany and Italy combined.

But perhaps, more importantly, in the next decade, important decisions will have to be made by governments concerning such issues as the use of natural resources, energy, climatic change. Without a scientifically literate electorate we risk those decisions being fudged or even dangerously wrong. At worst this could place at risk our civilisation. We are living on our capital, it cannot go on for ever. We are not in equilibrium.

These are global issues, central to which is our view of the Earth as a planet. I know of no subject better than astronomy as a vehicle for presenting the wider perspective.

It is against this background that I believe our Association will be making its future contributions.

We have already done much. We have been a strong advocate for astronomy in education and our views are listened to with respect. We have assisted in the delivery of astronomy into the classroom through our excellent Primary Work Pack. We originated it and published it jointly with ASE. To date more than 5,000 have been sold and we are onto the second print run. Our Secondary Pack is due out shortly. Here I would like to take the opportunity of congratulating most heartily all those who gave up so much of their spare time to produce this valuable teaching tool.

I would add that there is considerable interest in what we have done, both in the rest of Europe, and in North America. There is a possibility of a North American version of our Workpacks. I have also spoken with officials at the European Commission who have expressed interest in our activities and may be prepared to fund a European conference on

astronomy teaching. This would be hosted by us jointly with an appropriate partner in the UK.

However, to make a significant future contribution we will need more resources.

Our next major task must be in the area of teacher training. We have the situation in which teachers are expected to teach elements of astronomy and, in general, they lack confidence and understanding. Our resource centres and our members have done valiantly in providing teacher training sessions. We have also given workshops at, for example, the ASE's annual meeting. But these can only touch on the edges of a huge problem: we have directly reached some thousands of teachers, but there are 32,000 primary schools alone requiring assistance. But we do have the experience and the skills to make our mark. We are uniquely qualified for this task. We are bending our minds to this now. But the project will require funding and resources beyond that which we need for our normal operations. To be effective we need more than the precious free time of busy people, however willing and committed they are. We will be seeking grants.

Within these wider matters we are also reviewing our services to members, some of whom will already have received and, hopefully, responded to surveys we have been undertaking. We will be paying attention to this valuable feedback during the coming year.

We have accomplished much: but there is more to do.

I would like to end by referring to the tremendous efforts of the team, Officers, Council members and others, who actually do the work. We are a voluntary society and dependent upon individuals sharing in our vision, who are prepared to devote their energies to our cause. In any role call there would be worthy omissions.

Julian Ravest

The Norman Lockyer Observatory – Article sent to *Gnomon* by George Wilkins

The Norman Lockyer Observatory on Salcombe Hill, near Sidmouth, Devon, has two twin astronomical telescopes, a small planetarium, and radio transmitting and receiving equipment. It provides excellent facilities for amateur astronomers and radio enthusiasts and is of considerable interest to school parties, local residents and visitors to Sidmouth and the surrounding area.

The principal telescopes are known as the McClean Telescope and the Kensington Telescope; each has its own dome and consists of two refracting telescopes on the same equatorial mounting. One of each pair is used for direct observations by eye, and the other is suitable for photographic observations. All of the telescopes are over 90 years old, but they are of high quality and are well suited to use by amateur astronomers. The planetarium is

in a small dome in the Mond building that also includes the radio room, a meeting room and other facilities. The planetarium is used mainly to show how the appearance of the night sky changes with time and place, but each demonstration usually begins or ends with a short talk that is illustrated by slides.

The Observatory is now owned by the East Devon District Council, but is operated on its behalf by the Sidmouth and District Astronomical Society and the Sidmouth Amateur Radio Society. The facilities are demonstrated during open afternoons in the spring and summer, and during open evenings in the autumn and winter. Arrangements may be made for group visits by schools and other organisations at other times. Charges are made on open periods and for visiting groups, and the receipts are used to cover the running costs of

the Observatory and for improvements to the facilities. The Astronomical Society has recently been awarded a grant by the Royal Society, on the advice of COPUS (the Committee on the Public Understanding of Science), for the provision of a video-camera, monitor and recorder that will be used primarily to enhance the appreciation by visitors of what may be seen through the telescope.

The Astronomical Society would be glad to hear from members of the AAE who might wish to bring a party to see the Observatory or who might be able to help the Society to ensure that its presentations to school parties, for example, are appropriate in both level and character.

Please write to the Secretary: Lance Kelly, Alma House, Alma Lane, Sidmouth, Devon EX10 8JP.

Included with the September mailing of *Gnomon* will be a leaflet giving details of the new undergraduate course at the University of Kent, Physics with Space Science & Systems, due to begin at the start of the next academic year in October 1991. Already outlined in the Winter 1990 issue of *Gnomon*, the brochure will give details of the course for teachers and for prospective students. Of particular interest to readers will be the coverage of space astronomy and the possibility for students to become involved in the research activities of the University's Unit for Space Sciences through the third year project, an integral part of the degree course.

Those requiring more information in advance of September should contact Dr J. Zarnecki, Unit for Space Sciences, University of Kent at Canterbury, Canterbury, Kent CT2 7NR. Telephone 0227-764000.

Astronomy and Modern Views of the Universe

A course for beginners at the University of Leeds

The meeting will take place at the Leeds University Adult Education Centre, from 7.00 to 9.00pm, the first one being in September 1991

The aim is to simply, in lay-terms, the contents of the universe and to discuss the ideas which form the present understanding of the cosmic processes involved.

Further details from the Department of External Studies, University of Leeds (tel: 0532-333222).

BOOK REVIEW

Letts Pocket Guide to Stars and Planets. Authors: Pamela Forey and Cecilia Fitzsimons.
Published: March 1991. Price: £3.50. ISBN: 1-85238-115-9

Here is a new book aptly described by its title. A handy pocket guide is always useful when out on a clear night or when school homework demands that reference be portable. Each page contains an illustration, most are of excellent 'photographic' quality, together with supporting information, sufficient to satisfy the keen beginner.

The guide starts with a section on the structure of the universe. Galaxies, nebulae, clusters and multiple star systems each have their place – text plus illustration. There follow the obligatory star charts showing, in a rather cramped style on the small page size, the night sky as seen in

the northern hemisphere.

The third section devotes a page to each of the main northern sky constellations. These will be particularly useful to anyone starting astronomy as a hobby. Unfortunately, the night sky is rarely as full as these drawn constellations portray. The more experienced observers will welcome the inclusion of nebulae, clusters, quasars and galaxies among the charts, but the beginner will have to learn how to select naked-eye objects from the fainter companions. Perhaps the solution might lie in two tone charts, keeping naked eye subjects in white and the rest in another colour

The final section takes the reader through the delights of solar systems. Pages include information and diagrams on the origin of the solar system, observing sunspots, meteor showers, planets and comets.

I can recommend this pocket guide to anyone with a passing interest in astronomy. It will be a valuable resource for children and teachers as well as local astronomical societies in their quest to attract a younger audience.

Bob Kibble

NEW FOR SUMMER 1991

A new publication available from the AAE is the Handbook for Astronomical Societies 1991 produced by the Federation of Astronomical Societies. The 1991 edition contains numerous sources of resources and astronomical organisations. It contains articles on 'Observing the Sun', 'Earth & Space in schools', 'European amateur observation centres' and 'The Pettisindex Network'.

There are also sections on FAS, astronomical societies, information sources, visual aid sources, sources of astronomical software, places to visit, periodicals and equipment supplies.

The 1991 handbook is available through the AAE at the special members price of £2.25.

PUBLICATIONS OBTAINABLE FROM THE TREASURER, AAE

Astronomy Video & Film Catalogue	(£1.50) (*39p)
FAS Handbook & Resource Directory 1989.	Reduced price (£1.00) (*74p)
FAS Handbook & Resource Directory 1990.	Reduced price (£1.50) (*74p)
FAS Handbook & Resource Directory 1991.	Reduced price (£2.25) (*74p)
Earth and Space Primary Workpack	£3.50 plus £2.20 post and packing.
Earth and Space Secondary Workpack	(In preparation)

* Overseas Postage

It would be greatly appreciated if overseas members, including the Republic of Ireland, would arrange any payment in Sterling on a London Bank.

RISINGS AND SETTINGS OF THE SUN

Robert Mills has produced a useful exercise for students in which a graph is plotted showing how the Sun's azimuth at rising and setting changes throughout the year. This exercise is another example of the use of a calculator, which is used to solve relevant spherical trigonometrical equations.

Readers who would like more information should write to Robert Mills at:
83 Firs Road, Firsdown, Salisbury, Wilts SP5 1SW
enclosing a stamped addressed envelope.

NEW COUNCIL, 1991-2 (ELECTED AT THE AGM)

President:	Julian Ravest
Vice-Presidents:	Dr D. Hughes, Dr D. Mannion, Donald Gold
Hon. Secretary:	Bob Kibble
Hon. Treasurer:	Nik Steggall
Assistant Secretaries:	Eva Hans, Teresa Grafton
Resource Centre Reps:	Ian Griffin (Armagh Planetarium) Martin Suggett (Liverpool Museum) Sylvia Chaplin (Jodrell Bank)
Ordinary Members:	John Flynn
Editor:	to be elected by the Council (ex-officio member)

SATELLITE NEWS

We have received details of this publication which appears monthly. It describes itself as offering a complete record of space activity, satellite launches, transmissions, spacecraft launches, space object re-entries, Soviet space news and military activities. The subscription is £24 per year.

Details from Geoffrey Falworth, 15 Whitefield Road, Penwortham, Preston PR1 0XJ.

SOLUTION TO GNOBLEM 13

Many readers sent in solutions, all based on Einstein's relativistic equation $E = mc^2$. E is the energy produced by the annihilation of matter of mass m ; c is the velocity of light. In this problem, E is the energy produced per second and m the mass lost per second. The Earth is at a distance of 1.5×10^{10} metres from the Sun. Thus the total energy produced per second by the Sun is (about) $2000 \times 4\pi \times (1.5 \times 10^{11})^2$ watts, if we assume the washing machine is rated at 2 kilowatts. This gives the mass loss per second as $2000 \times 4\pi \times (1.5 \times 10^{11})^2 / (3 \times 10^8)^2$, or about 6×10^9 kilograms per second.

Some readers modified this figure by assuming some loss of energy by absorption by the Earth's atmosphere.

An impressive figure – about six million tonnes of solar mass lost per second!

GNOMON 14

The Moon travels around the Earth in an almost circular path. At the same time, the Earth moves in its orbit around the Sun. The combined effect of these two motions is to make both Earth and Moon weave in and out of each other's orbit (see diagram). And yet *at all times* the orbit of both bodies are concave towards the Sun (never convex). Explain why this is so.



THE PENZANCE PERIPATETIC PLANETARIUM

by Richard Knox

In a fit of rashness, at the end of my adult education course last year, I suggested to the class that I would acquire a planetarium for use in the next session, either by buying or making the equipment. Suspecting that commercially available equipment would be too expensive for a strictly private venture, I called for volunteers to help. In the event I did construct my own planetarium. One of the students who volunteered turned out to be an invaluable partner in the project, enabling us to finish it (just) within a year of the original announcement.

The original concept for the dome was based on a design described in the BAA Journal in 1974 by George Haig. This was made of 12 cartridge paper segments, ribbed with cardboard, clipped together and suspended from the ceiling. It would need to be hung from a fairly sturdy hook in the ceiling of a fairly high, dark room. But my plans were to make a planetarium that could be used anywhere, particularly in local schools now that AT16 requires teachers to cover some aspects of astronomy. I did not think that many places could be found where one could hang up the dome from the ceiling in darkness, especially during the school day.

So the basic concept changed to a dome in a self-contained 'theatre', which would be in total darkness, but which could be readily dismantled and transported by car.

The design and construction of the enclosure and the dome-segment wooden former, were taken on by my volunteer student. The result was a 3m square structure, 3.5m high, made of wooden spars that slot together, being bolted in just a few places, usually only requiring finger tight-

ness to secure the nut on the bolt. The 3m diameter dome is assembled on part of the frame that is lifted to a height from the ground of about 1.5m. Two 3.5m vertical spars support this, and a square frame hoisted to the full height, allowing the entire structure to be covered in agricultural black plastic to exclude light.

A fundamental change from Haig's dome design was that, having constructed the cartridge paper dome and found it far from satisfactory (too flimsy, flexible, and liable to damage) we rebuilt it to the same pattern, using a plastic board instead of paper. The plastic board is made of two smooth white sheets separated by membranes, making something like corrugated cardboard. It is produced in large dimension sheets for use in the building industry, and the thinnest in the range (3mm) was ideal. The material is thermoplastic, so it could be partially moulded by heat, and the segments made of it are durable, self-supporting and washable.

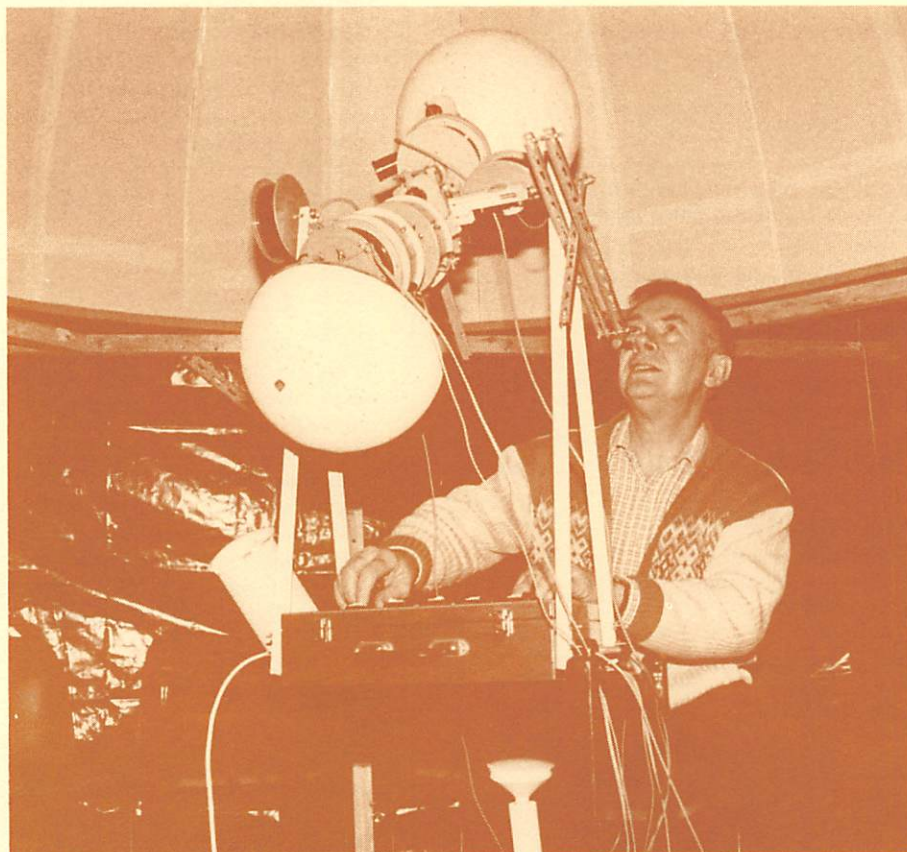
Anyone contemplating such a project could save themselves a lot of money and time by talking to other constructors (see References) and I am willing to supply further details on request.

References

Haig, G.Y. *J. Br. Astron. Assoc.* 84, 432.
Ford, H.Y. *J. Br. Astron. Assoc.* 96, 349

Note:

Mr Ray Worthy of 15 Queensbury Avenue, Hartlepool TS26 9NW, has also constructed a planetarium, details of which may be obtained by contacting him at this address (telephone: 0429-268086).



Richard Knox at the controls of the projector, inside the Penzance peripatetic planetarium.

Video Films from Viewtech

Information supplied by
Armagh Planetarium

Six video cassettes on astronomy are available for purchase or hire from: Viewtech, 161 Winchester Road, Brislington, Bristol BS4 3NJ.

- Comets, Meteors and Asteroids (12 minutes)
- Exploring the Moon (16 minutes)
- Close-up on the Planets (20 minutes)
- Planets (24 minutes)
- The Solar System (12 minutes)
- Our Sun and its planets (15 minutes)

A critic informs us that much of the material in these videos is out of date, some 'more disastrous than others'. Nevertheless, they may be used in the classroom if proper care is taken

Ships, Stars and Satellites

Plymouth has a long and proud maritime heritage, and to this day a large proportion of its population has links with maritime concerns. A conference entitled 'Ships, Stars & Satellites' will be held on Tuesday, 27 August, in the Planetarium and Maritime Teaching Block of Polytechnic South West. This John Mason conference is jointly organised by the Royal Astronomical Society and the Royal Institute of Navigation, as part of the British Association SCIENCE 91 Meeting to be held in Plymouth this year, hosted by the Polytechnic, from 25 to 27 August 1991.

Further details may be obtained from
Dr P. Seymour, William Day Planetarium
Polytechnic South West, Drake Circus
Plymouth PL4 8AA
(telephone 0752-232462).

Subscription Rates:

Individual members £7.50
Retired Members 5.00
Affiliated institutions
(e.g. schools, colleges, etc.) 15.00

Affiliated members will receive several copies of *Gnomon*.

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

Addresses for Correspondence

Secretary: Bob Kibble, 34 Acland Crescent, Denmark Hill, London SE5 8EQ – for all general enquiries.
(Tel: 071-274 0530)

Treasurer: Nik Steggall, 38 Victoria Crescent, Birkdale Road, Dewsbury, West Yorkshire WF13 4HJ – for all financial and subscription enquiries. (Tel: 0924-454718)

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

Advertising Charges

Whole page£120
Half page£60
Quarter page£30
Inserts.....£75 *

* These may be of any size which may conveniently be inserted into the newsletter. There may also be an additional charge for posting if the inserts are heavy.

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