GNOMON

Newsletter of the Association for Astronomy Education

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EDITORIAL

Readers of *Sky and Telescope* may have seen an article in the November 1988 issue entitled *Star Trails*. This is an article which may be read with profit by AAE members and also by members of the FAS as it deals with the education and the *inspiration* of children by *amateur astronomers,* not (necessarily) by teachers. Without detracting in any way from the work put in by teachers, the author, David Levy, highlights the importance of the amateur astronomer, as opposed to the teacher or professional, because his interest is real and inspires enthusiasm. Any non-astronomer who has visited an astronomical society on an "open night" will come away with the feeling of excitement.

Mr. Levy explains his own interest in the subject. He started out in 1976 as a "nature instructor" at a day camp at Montreal for children aged 4–12. Their schools provided nothing on astronomy, but Mr. Levy's programme included everything in the local environment *including the stars* in the heavens. He introduced a taped weather forecast for Mars ("turning unseasonably cold tonight").

The children observed the Sun (by projection) and saw the sun-spots changing their positions daily. They measured how long it took for a projected image of the sun at the telescope's focus (using an f/7 refractor) to ignite a plastic bag – they made bets on this length of time. This brought home the sun's enormous power.

Then, at night, at first they merely relaxed and looked at the stars. Some children were won over immediately, others needed further coaxing. In time, they could discern different colours amongst the stars. This colour was linked to temperature (compare the plastic bag ignition experiment).

Telescopes were subsequently brought out and trained on the Moon. It was important to ensure that what they saw was not what they thought they *ought* to see! "Don't let the children get away", Mr. Levy tells his fellow instructors, "until you are sure they have succeeded in their viewing. If you look into their eyes and see their excitement, then you will know why *you* become an amateur astronomer".

ADDRESSES FOR CORRESPONDENCE

Secretary: Bob Kibble, 34 Acland Crescent, Denmark Hill, London SE5 8EQ. *For all general enquiries* (Tel: 01-274 0530).

Treasurer: Nicholas Steggall, 38 Victoria Crescent, Birkdale Road, Dewsbury 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).

AAE Video and Film Catalogue on Astronomy

This catalogue is now available from the Treasurer, Nick Steggall (address given elsewhere in this issue). The list covers about 300 titles. Many members have already acquired their copies, which cost 75p (non-members £1.50). Copies are also available from the Federation of Astronomical Societies, the Institute of Physics, the Royal Astronomical Society and the Junior Astronomical Society.

(Apologies for not including the British Astronomical Association among the list of supporters in the last issue. This omission was rectified in the catalogue itself).

PRESSURE ON SPACE. Many items have had to be held over until the next issue as there was insufficient space to print all contributions.

Subscriptions

These were due on 1 September 1988. We know from experience that several members forget to pay theirs – in this complex world of ours, it is so easy for renewal applications to become buried under piles of other correspondence. May we appeal to these members to check whether or not they have paid, and if not, to send their subscriptions directly to the Treasurer. A Council decision that members more than 3 months in arrears should not be sent the Newsletter will be adhered to.

Subscription rates are:

Ordinary member	£ 6.00
Affiliated institution	£12.00
Retired member	£ 4.00

Practising teachers may claim tax relief on their subscriptions.

ASTRONOMY COURSE AT BIRKBECK COLLEGE

A Saturday school in "Astronomy" will be given at Birkbeck College, London, sometime in March. There will be various lectures. Anyone interested should contact Birkbeck College at 26 Russell Square, London, WC1B 5DQ, telephone 01 636 8000, ext. 3833/3850.

WORK-PACK FOR SCHOOLS – "Earth in Space"

The Education Group of the AAE is preparing classroom material for primary and secondary schools. The material is relevant to Attainment Target 16 of Science in the National Curriculum. We intend that all the worksheets, teachers' notes and resources lists will be complete by January 1989 for publication in the spring. *We need your help.*

Extensive trials of this material are needed. If you teach children of 5–16 years and would like to test some of the projects in your classroom, please contact Dr. Anne Cohen, 9 Hurst Lane, Bollington, nr. Macclesfield, Cheshire, stating the age range of your class.

Advertising in GNOMON

Members adverts of reasonable length are *free.* So if you have a telescope for sale, or wish to buy accessories, slides, books and so forth, remember you may advertise them in this Newsletter. A small charge will be made for the same facilities offered to non-members.

Commercial adverts are best made as inserts. The cost will depend on the material supplied, and will take into account any possible increased postal charges. Contact the editor for details.

INFORMATION WANTED

The AAE is interested in the type of audio-visual equipment used by teachers for teaching astronomy. (Slides, films, videos, computers, etc.). Please send any information to the Secretary.

The British Universities Film & Video Council

By Jim Ballantyne, Information Officer, BUFVC

The BUFVC is a representative organisation, founded in 1948. It exists to encourage the use, production and study of audio-visual media, materials and techniques for teaching and research in higher education. It concerns itself with all disciplines and aims to gather information on all audio-visual materials that are available for hire, sale or free loan to teachers in the tertiary sector. The changing emphases in education in recent years have brought about a broadening of this remit to include open learning, and many of the materials listed in the Council's publications are suitable for 6th formers as well as undergraduates. The Council has been producing catalogues, including *Audio-Visual Materials on Astronomy: an International List* (1974), for over 25 years.

Some subjects by their nature lend themselves readily to audio-visual presentation. Astronomy and physics are good examples. The Council has undertaken joint projects with the Institute of Physics (and Royal Meteorological Society) over a number of years and the IOP and the Royal Astronomical Society are now collaborating with us to produce a new catalogue, *Physics & Astronomy: Video & Film Resources,* which is to be published in June 1989. This will list some 600 materials suitable for 6th form level upwards. Programmes produced by universities, polytechnics and colleges, including the Open University, will automatically be included and a review project is underway to select those commercially-produced programmes which can be recommended. Each entry will contain a synopsis of content, production details, etc., and will indicate the level and course for which the item is suitable.

The provision of new and current information is the essential task of the Council's Information Service. The Council's members do their part by submitting to us details of their new programmes as soon as these have been produced. Some members, indeed, notify us of forthcoming productions. New technology has enabled us to refine and speed up the production of our publications. It also ensures that we service our members (ordinary, associate and corporate) and our individual Information Service Subscribers more efficiently.

In the Information Service Library are filed hundreds of current distributors' catalogues, mainly British, but also foreign. The *British National Film & Video Catalogue* and many subject guides, such as the new AAE astronomy catalogue, are also held. An online database HELPIS, available through the British Library's BLAISE-LINE service, gives full details for over 6,800 currently available materials. The annual *BUFVC Catalogue,* produced on microfiche in January of each year, corresponds to the database in that month. All the materials listed have been appraised and recommended for use in degree-level teaching, many also for 6th forms. Information from appraisals and reviews can be made available on request. Among the physics and astronomy records are a number on offer from the Council's own Higher Education Film & Video Library, or held in its preview facility, the Audio-Visual Reference Centre.

Details of other Council services and activities may be had from the BUFVC at 55 Greek Street, London W1V 5LR. Tel: 01-734 3687.

Jim Ballantyne
Information Officer

ASTRONOMY IN IRELAND

By Dr. Ian Elliott, Dunsink Observatory, Dublin Institute of Advanced Studies

As part of a one day meeting entitled "The Challenge of the Cosmos" held at the Royal Irish Academy on 5th October 1988, the Irish National Committee for Astronomy organised a session on "Astronomy as a Medium of Science Education". Professor John Heywood of the Education Department in Trinity College spoke about educational philosophy and reform and suggested possible initiatives to promote a better appreciation of astronomy in the teaching profession. Dr. Ian Elliott of Dunsink Observatory advocated a holistic approach which would emphasise the close links between astronomy and other school subjects. Recent developments in astronomy education in the UK were described by Mr. Martin Ratcliffe of Armagh Planetarium. Concluding the session, Professor Patrick Wayman of Dunsink Observatory recalled an astronomy course for teachers which had been held in 1974 and referred to current developments, in particular the STAR programme – Science Teaching through its Astronomical Roots – which is supported by the US National Science Foundation at the Center for Astrophysics in Cambridge, Mass.

Earlier sessions had dealt with ground-based and space-borne research facilities in astronomy available to Irish scientists; these were part of the regular six-monthly meetings of the Astronomical Science Group of Ireland. The meeting concluded with an evening discourse by professor Wayman on Supernova 1987A.

How Much Can They Take?

By Donald Gold

I recently gave a talk, illustrated by slides, to a small Primary School on various aspects of astronomy. The Headmistress thought that a general talk would be useful and she assembled the whole school – some ninety or so children and suggested that the very young ones would leave after half an hour and that I could continue with the rest as I thought fit.

I welcomed it as a wonderful opportunity to experience the reactions of children of their age groups, and to test some of my own ideas on how much children can take in; to my mind we can so easily underestimate their capabilities and understanding. It was a country school on the Berkshire Oxfordshire border with children of mainly middle class parents with a sprinkling of countryside workers.

I started with a general talk about the Moon, which they had all seen, and then showed them a number of slides selected from the Apollo missions showing the first men on the moon, the buggy, the landscape and the Earth viewed from space, ending with the splash down and the astronauts' return.

We then had questions and I was most interested in the width and, one could almost say, depth of them! How long did it take to get there? What was it like having to stay so long in such small quarters in the space craft? Was there any danger of something hitting the spacecraft? Was it hot or cold on the moon's surface? Will there be stations on the Moon? and so on.

The youngest children then left, and we carried on with a talk about the planets. Most of the children had seen the eye-catching sight of Venus and Jupiter together in the evening sky and that provided a starting point. I then showed slides of the Voyager 1 and 2 encounters with Jupiter, and one little girl immediately asked why it was so red and coloured when it was just a white spot in the sky. I also showed a few slides of the Voyager 1 and 2 encounters with Saturn, but it was clear that I could show only a very few of them as, to the children, they were very similar and to them it was the first impression, the size, the colour, the rings and the moons that mattered.

But here again, when I paused for questions there were all sorts of comments on what it would be like to really go there. Would it be very hot and could one land on the surface as the men on the moon had done. And here again, the concept of distance was approached by considering the time it had taken the Voyager craft to arrive at Jupiter and Saturn.

Most of the children were familiar with the Television series on Star Trek and the adventures of the Star Ship Enterprise with Captain Kirk, Spock and the Doctor! So the idea of eventually travelling in space was not new, if a little simplistic given the apparent ease with which the various missions of Captain Kirk were accomplished. But I had seen enough of the TV series myself to talk about space travel with the children with these particular adventures as the reference point.

Several of the children wanted to know what Space really was, and also whether it would be very quiet or noisy out there!

So I talked about Space beyond the Solar system. But none of the children had seen the Milky Way, although a number of them had looked at the night sky through binoculars and they had wondered about the "lots of stars" that they had seen. A few slides of various galaxies and the masses of points of light that could be seen brought this final part of the talk to life; and the large number of questions were again evidence that a lot of it had at least aroused interest and wonderment. How many stars were there, would they always be there, do they burn out, would space ships ever reach them?? Here again the missions of Captain Kirk provided assitance in that the Enterprise is capable of special and extraordinary speeds which I could talk about with the children.

Finally, the Headmistress had to intervene as it was lunch time. Indeed, the morning had flashed by, and there was still a group of little boys and girls who wanted to know about the possibility of people living on other worlds and what they might be like. We went on talking while I strolled among them and drifted out of the school hall . . .

Nothing that I have said is new but the experience reinforced my feeling that it is easy to underestimate the ability of children to learn about things for which some educationalists might maintain that they were not ready.

I would be the last to pretend that all those children came away with clear conceptions about astronomy, its distances, its time scale and so on. But their exposure to what I had to say and to show them with the slides clearly stimulated interest and questions, and that, after all is what education is about. I well remember that my own preparatory school was never afraid of extending us with subjects that in many schools nowadays would not be touched upon until a much later stage. My wife had the advantage of a French education which was certainly much wider than my own British one, and I came across the fascination of European and World history for example at a much later stage – to my disadvantage I am sure.

The Headmaster of my Senior School, who had been a professional astronomer, would come into our classroom from time to time and take over from the master in charge, and instead of Latin, Georgraphy, Mathematics

or whatever, we would have a wonderful hour of Astronomy. I am sure that if we could only introduce that sort of system it would be a great step forward, short, that is, of a more regular or an integrated science approach. Clearly we are making progress but it is very slow. The Headmistress of this Primary School welcomed my input and thought a follow-up would be very useful.

But if only a few of the children I had the pleasure of talking to now look up at the night sky with more interest than they did before and look for books about it or ask their teachers (provided that the teachers are not afraid of the subjec to "have a go"), some bonus points would have been gained.

Later, I received a huge Greetings Card that had been made at the School which every child had signed thanking me for my visit. That was in itself a reward.

"The Teaching of Astronomy" – International Colloquium

By Dr. Fiona Vincent

In July 1988 the International Astronomical Union held its 105th Colloquium, in Williamstown, Massachusetts. The topic was "The Teaching of Astronomy: Present and Future". As astronomer in charge of the public Mills Observatory in Dundee, I was privileged to be one of about 160 delegates from 30 countries.

Within the four days of the Colloquium, some 100 oral and postal papers were presented. I found that more than I had expected were of interest to me. The factor which I had overlooked was clarified by Donat Wentzel of the University of Maryland, in the very first paper – the difference between the American and "traditional" education systems.

In America, nearly half of the high-school pupils go on to college. In most of these colleges there is a "breadth" requirement – those majoring in an arts subject are required to take one science course as well. Astronomy is a popular option. So the majority of the American speakers at the Colloquium were discussing ways of teaching astronomy to young adults with little scientific knowledge and (usually) with an aversion to mathematics. This is very similar to my own situation in giving lectures to visiting groups and to evening-classes.

Some of the benefits I brought back were obvious and tangible. There were handouts and information sheets, and various free samples. I was able to purchase an inexpensive set of overhead transparencies that make up into an animated model of the earth-sun-moon system; these are produced by the Comité de Liaison Enseignants Astronomes (CLEA). And I ordered a set of plans for the inexpensive telescopes designed by Roy Bishop of Acadia University, Nova Scotia.

I also brought back some good ideas! Roland Szostak, from a teacher training college in Germany, demonstrated a planisphere for use on an overhead projector. The stars were pricked, not on opaque paper, but on one of a pair of polarising filters. Rotating the filters gives daylight and night, and a sheet of cellophane between them changes the colour of the "sky". Sydney Observatory uses the old Victorian idea of zoetropes in their exhibition area to demonstrate moving phenomena. Jeanne Bishop, who works at a planetarium in Ohio, teaches the children songs to help them memorise such facts as the names of the planets. These are all techniques I can adopt.

But some of the presentations were useful in a much wider way. Philip Sadler of Project STAR (Science Teaching through its Astronomical Roots) showed that many people begin with misconceptions about the universe, which may be quite untouched by a course in astronomy. They hear the teacher's words, and they may reproduce them accurately at examination time. But in his video interviews made a few months after the end of a course, high-school students were still giving the wrong explanation of, for example, the seasons. It became clear that we can only teach effectively if we first identify and root out the misconceptions. One way to do this was described by Mazlan Othman, from Malaysia. She asks her students to comment on a traditional legend about the heavens.

There was also much interesting discussion of questions such as why we teach astronomy, and what exactly it is that we are trying to teach. For the small number of students who will actually become astronomers, topics like spherical astronomy and stellar structure are important and relevant. But for those who "simply want to know a little more about their universe" (quotation from a student) it seems better to concentrate on the things they can experience for themselves. Night and day, winter and summer, the phases of the moon, the movements of the planets – these are available for anyone to observe, and if we can teach people to understand their causes, they will have a richer appreciation of what is going on around them. (Michael Dworetsky of University College London confessed that the majority of his students end up, not as astronomers, but as "yuppies" – but the audience thought they might be better yuppies for having studied astronomy . . .)

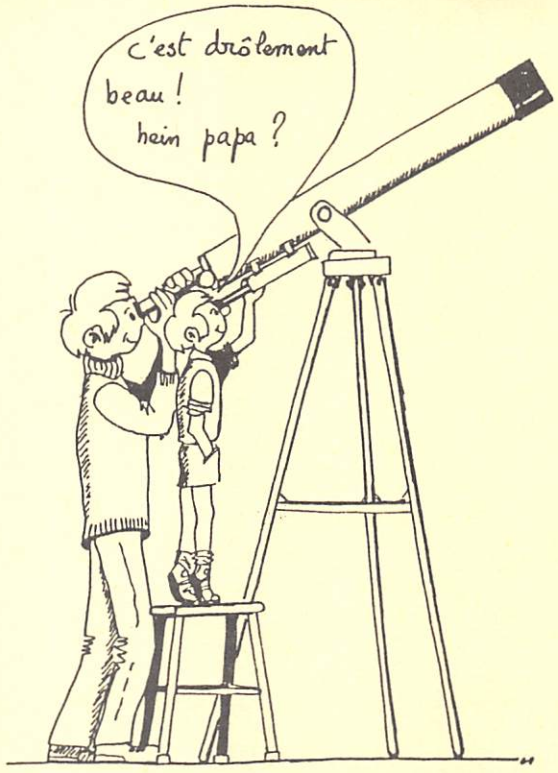
In this context, the sessions on the developing countries were particularly interesting. From Asia, Africa and Latin America, speaker after speaker told of valiant work by a handful of astronomers and teachers, and pleaded for help and support to continue the work. The feeling was strongly expressed that knowledge of astronomy gives us a unique sense of our common humanity on one small planet, and could make a real contribution to world peace.

Besides the formal sessions, Jay Pasachoff and friends at Williams College kept us richly entertained with excursions, theatre and concert outings. We took part in the sesquicentennial celebrations of the college's Hopkins Observatory, the oldest extant astronomical exhibition at the town's Clark Art Institute. And we still found plenty of time to chat to each other! – I think I managed to talk with nearly half the delegates at one time or another.

Perhaps the single most useful thing I brought back was the list of names and addresses of those participating – a reference list of 160 people who are treading the same road as me, and with whom I can share techniques and experiences now and in the future.

Attending this Colloquium was most rewarding, and I am very grateful to those who enabled me to do so. John Percy of Toronto, as Chairman of the Scientific Organising Committee, arranged for my registration and accommodation fees to be waived. My travel expenses were largely covered by a generous grant from the Robert Cormack Bequest Committee of the Royal Society of Edinburgh, and the remainder of my expenses were met by my employers, the City of Dundee District Council.

Note: **The AAE is pleased to announce that cordial relations have been established with the French Astronomy Teachers (CLEA) mentioned in Dr. Vincent's article, and that they have given permission for reproducing in *Gnomon* some of their excellent cartoons.**



Reproduced from "Les Cahiers Clairaut" by kind permission of the Secretary of CLEA, M. Gilbert Walusinski, St. Cloud, France.

SPACE SHUTTLE FLIGHTS IN 1988

1988 saw both the return to flight status of the US Space Shuttle and also the first flight of the Soviet Buran shuttle onboard the Energiya launch vehicle.

The launch of the Discovery shuttle orbiter on the STS-26 marked the first time in 34 months that US astronauts have ventured into space. More than a hundred and fifty fixes had been made to the vehicle from the important O-ring seals in the Solid Rocket Boosters to the addition of a parachute system in the event that the crew had to bail out of the orbiter. The four day mission started with a spectacular and tense launch on September 29, 1988 from Pad 39B at the Kennedy Space Center.

During the flight, the prime payload was the third Tracking and Data Relay Satellite and Inertial Upper Stage combination. Six hours after launch the TDRS-C/IUS-7 payload was released from Discovery. After coasting for one hour the IUS ignited its first stage to send the TDRS satellite on its way to geosynchronous orbit, 36,000 km about the Earth.

There were eleven secondary payloads to keep the astronauts busy during the mission including two Shuttle Student Involvement Project experiments such as the one utilising a semi-permeable membrane to direct crystal growth.

Discovery landed at the Edwards Air Force Base in California on runway 17 on October 3, approximately 97 hours and 57 seconds after launch.

SOVIET SHUTTLE

The first attempt at launching the Soviet Shuttle called Buran (Snowstorm) stopped just 51 seconds from lift-off, the reason being that computers stopped the countdown when a platform which contains a system to adjust gyroscopes on the Energiya (Energy) launch vehicle failed to pull away far enough before launch.

Buran was finally launched on November 15, 1988 on a two orbit, 3 hour 25 minute flight landing only 7.5 miles away from the launch pad at the Baikonour Cosmodrome.

The first flight was fully automated and paves the way for a manned flight on either the second or third flight in 1989. When the Soviet Shuttle becomes operational it will take off two to four times a year and be capable of taking up to ten cosmonauts into space at one go. It will also give the Soviets the capability to launch space station modules, heavy satellites into orbit and to return them back to Earth.

While the Soviet Shuttle was preparing for launch, the cosmonauts aboard the MIR space station were breaking the space endurance record. Vladimir Titov and Musa Manarov passed the earlier 326 day record on November 12. They will return on December 21 when the joint Soviet/French flight ends.

DEFENCE SHUTTLE MISSION

The third Shuttle flight of 1988 was the US STS-27 flight. This was the third flight of Atlantis and the 27th of the programme. Launch occurred on December 2, one day late, due to bad weather at the Kennedy Space Center.

The crew consisted of commander Robert L. Gibson, pilot Guy S. Gardner, and mission specialists Mike Mullane, Jerry L. Ross and William M. Shepard.

Atlantis was launched into a 57 degree orbit where a radar imaging reconnaissance satellite was deployed.

N. E. STEGGALL

WEATHER FORECAST FOR PLUTO

By Mr. Terence Tinsley and pupils of Highfield School

Since we have only known this planet for 58 years, this forecast is rather sketchy and probably unreliable.

There will probably be clear skies over the sun-facing hemisphere, in whose darkness the sun will brilliantly outshine the other stars. At its closest distance of only 30 AU, the sun should be a magnificent sight, at mag. −4.2. On the far side of the planet the long night (124 earth years) will continue. There may be traces of wispy clouds of methane from which a slight precipitation of methane droplets or hailstones may be produced. Temperatures on the light side will be around −230°C, while on the dark side temperatures will remain at around Absolute Zero.

The moon (Charon) will move round a further 30° during the next 24 (earth) hours. Locked in synchronous rotation with Pluto, it will keep its same face towards the planet, and will subtend some 2½°, thus appearing to be larger than the moon from earth.

GCSE EXAM QUESTIONS

Some comments on the 1988 paper:

Question: Calculate the RA of a star observed 2 hours before culmination from longitude 5°30′E at 1000 hours Greenwich Sidereal Time.

Comment: I had to read this three or four times before deciding what was wanted. I am sure the question could have been expressed more clearly. I made the answer $12^h\ 22^m\ 20^s$ if the two hours are in sidereal time, but I shall be happy to be corrected if wrong.

Question: You are selecting an eyepiece for a 4-inch reflecting telescope, which has a mirror of 80cm focal length. A reasonable working value for "optimum" magnification is often taken as 25 times the diameter of the mirror in inches.

(a) Calculate what focal length of eyepiece you require.

(b) State which **one** of the following would be most suitable.

Eyepiece	A	B	C	D	E
Focal length (mm)	4	25	12.5	10	40

Comment: This is a sad mixture of inches and SI units. The word "optimum" is ambiguous. Does it mean best, most useful or the maximum possible? (Best for whom? for what purpose?)

The 25-times magnification per inch formula means that the exit pupil is no more than 1mm, whereas the eye has a light adapted pupil of 8mm.

Question: A reflecting telescope has a small diagonal mirror mounted on axis inside the tube. Explain why this does not obstruct viewing.

Comment: To be precise, the word "significantly" should appear before the word "obstruct". This is particularly important as the next part of the question asks for a calculation of the effect of the obstruction for a given telescope.

Robert Mills

Alec the Asteroid

Not many people are fortunate enough to have a celestial object named after them and so Alec Boksenberg, Director RGO, was understandably beaming when just such an honour was bestowed upon him. The object in question is an asteroid, about 12–15 kilometres in diameter and lying about 130 million miles away. Discovered by Eleanor Helin, a planetary scientist from the Jet Propulsion Laboratory, Passadena, it was officially named "Asteroid (3205) Boksenberg" (but dubbed "Alec the Asteroid" by Tom Wilkie of *The Independent*) in recognition of the advice and guidance given by Alec to Eleanor when she was starting up her asteroid observing programme in 1979 at the UK Schmidt telescope. The official citation also recognises his invention of the Image Photon Counting System and its application to a wide variety of astronomical problems. At a small ceremony at Herstmonceux Castle in September, Eleanor presented Alec with a commemorative plaque showing the discovery photo. Also present at the ceremony were Patrick Moore and former NAO staff member Gordon Taylor, both of whom already have asteroids named after them.

Chas Parker

This article appears in Gemini 22 (December 1988) *the Newsletter of the RGO. It is reproduced by permission of the Editors, Chas Parker and Keith Tritton.*

ASTRONOMY IN THE NATIONAL CURRICULUM

A report from the AAE seminar held in Imperial College, London on September 24th 1988, 2.00pm.

Present:			
D. Gold	AAE	B. Kibble	AAE
N. Steggall	AAE	J. Ravest	AAE
R. Mills	AAE	A. Cohen	AAE
D. Mannion	AAE	D. Thompson	ESTA
T. Grafton	AAE	K. Jones	LEAG
E. Zucker	AAE, FAS	R. Owens	FAS
E. Hans	AAE	M. Ratcliffe	BAA
U. Concannon	AAE	K. Whaler	RAS

The aims of this seminar were:

i. to enable ideas concerning astronomy education and the National Curriculum to be shared.

ii. to explore ways in which the bodies represented could co-ordinate efforts and respond to the needs of teachers who would be expected to deliver the National Curriculum.

Following a welcome from AAE President Donald Gold, Anne Cohen outlined the main features of the National Curriculum consultative document and in particular attainment target 16, 'the earth in space'. Anne then spoke about the recent initiatives with which the AAE was involved, in particular the efforts of the AAE education group to produce teaching materials for ages 5 to 16.

Speakers representing bodies related to the AAE outlined the ways in which they were responding to the National Curriculum. The ensuing discussion was far reaching and will not be reported in detail. General points emerging from around the table included:

* support for the inclusion of target 16 and a feeling that it represented the minimum entitlement for all pupils.

* the recognition that a considerable programme of in-service training was needed to give teachers the confidence and interest to bring aspects of astronomy into their lessons.

* the need for trialled curriculum materials for use at all levels. Some slides, videos and worksheets were already in existence and needed to be co-ordinated.

* the recognition that the levels of attainment for target 16 could be achieved through a number of curriculum models. In primary schools project work on themes such as space or the solar system is likely to be a feature of the curriculum. From 11 to 16 the 'earth in space' targets might be achieved through a modular curriculum or through integrating astronomical ideas within other curriculum areas such as maths, science, art, history, environmental studies etc.

Following a welcome break for refreshments, Julian Ravest outlined his thinking on the way ahead. He suggested that the AAE take action on three levels:

1. To draft an immediate response to the National Curriculum document outlining those issues of concern and the areas of support needed in order that the curriculum be delivered.

2. To press on with the development of curriculum materials but at all times being aware of:

   i. the need to share the workload with other related bodies and to avoid duplication of effort.

   ii. the need to ensure that, through trailling, the materials produced would actually be of use to teachers.

3. To explore the various avenues for inset. These might include using the AAE network of resource centres, teacher training institutions, LEAs, their teachers centres and advisers, the ASE and other related science groups.

The seminar closed at 5.10pm.

On behalf of the AAE I should like to thank all those who attended the seminar for giving up their time and energies.

Bob Kibble,
Secretary, AAE

ASTRONOMER'S GARDEN

The Warehouse Theatre, Croydon, recently staged a new play by Kevin Hood called the Astronomer's Garden. It dealt with problems encountered by the first Astronomer Royal, Flamsteed, at Greenwich. The play may be given another showing at the Royal Court Theatre.

Anyone who would like to give a talk to the Mid-Essex Astronomical Society should contact the Secretary, John Blake, at 58 Woodway, Hutton, Brentwood, CM13 2JR.

Astronomy in the National Curriculum

As agreed at this seminar, here are the contact addresses of those who attended on 24th September, 1988.

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Dr. K. Whaler,
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Astronomy in the Marketplace

by Dennis Schatz
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The allure of astronomy is so strong that many companies have named products after astronomical objects. During an astronomy unit, students may enjoy compiling a list of such products and thinking about other astronomical terms that await commercialization. This activity is best done over the period of a week or so, but need not involve substantial amounts of class time.

Objectives

1. To help students see that astronomy has influence outside the scientific arena, 2. to increase their familiarity with astronomical terms, and 3. to develop the students' creative thinking skills.

Projects

After some discussion of the fascination of astronomy, ask students to list some common consumer products that have been named after astronomical objects. Here are some examples to get the discussion going:

Automobiles: Ford Taurus, Mercury Comet, Dodge Aries, Ford Galaxie, GM Astrovan, Nissan Pulsar, Toyota Corona, Chevy Nova, and Subaru (which means Pleiades in Japanese; the Subaru logo at the front of each car actually shows a number of the stars in the Pleiades star cluster.)

LETTERS

Dear Editor,

Association for Astronomy Education

Your leaflet, which arrived today along with the latest F.A.S. Bulletin, could not have come at a more opportune moment. I am in the process of drafting the syllabus for an adult education course in Astronomy to run for 10 weeks starting on 29th September. This is a 'general interest' course under the auspices of Lothian Regional Council Community Education Service.

I am Secretary of the Astronomical Society of Edinburgh and one of my predecessors gave a similar course for many years until failing health forced him to retire some 12 years ago. I felt for some time that the course should be resurrected and decided this summer to do something about it. Although this is a course for adults, I am also considering a series of lectures to local schools and, of course, enthusiastic adults can pass on some of their interest to youngsters.,

I am not a trained teacher or professional astronomer but I have a good background in mathematics and physics and have had a deep interest in astronomy for the past 45 years or so.

Might I offer a suggestion? A planisphere is a most useful tool for learning about the night sky and I am hoping to receive permission to photocopy the Greenwich Sky Chart to use as a 'throw away' one during my course. The idea is that participants will mark the positions and movements of planets, comets, etc. on it as well as its normal use in identifying the constellations and fixed stars. I have deliberately not attempted to provide a central pivot since this would necessitate closing the mask with a transparent cover, making it more difficult to mark the positions of objects on it. A specimen of the sort of thing I have in mind is enclosed – the actual ones will be pasted on to thin card.

Yours sincerely,

Ian Neil,
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Note: Mr. Neil's mask has been received by the Editor. Interested readers should get in touch directly with Mr. Neil.

GNOBLEM 5

Astronaut Myopius was feeling very satisfied with himself, having just landed on the Moon after a faultless voyage from the Earth. With his colleague, Astronaught Hypermetropius, he was preparing all the equipment necessary for conducting the many scientific experiments which were expected to be carried out during the next few weeks.

Suddenly, he felt uneasy. Something was wrong. He voiced this unease to Hypermetropius: "Where is our clock? I can't find it amongst all this apparatus." Hypermetropius joined in the search, with no avail. Stunned, they looked at each other. "We must have left it behind," faltered Myopius. "And we don't even have wristwatches".

"As so many of our experiments involve a precise knowledge of the time," said Hypermetropius, "what on Earth – or more aptly – on the Moon, are we going to do? We must devise an accurate system of time-keeping which we can relate to clock-time on Earth".

"I agree," said Myopius, "and the only thing we can do is to devise a scheme based on the apparent motions in the heavens of the Earth and the Sun, as well as the rotation of the Moon, on which we are now standing, about its axis. We must bear in mind that (1) the Moon revolves around the Earth (or more strictly the centre of gravity of the Earth-Moon system) once in about 28 Earth days, (2) the Moon always presents the same face towards the Earth, and (3) the ecliptic, with which we are so familiar on Earth, is not so significant to us on the Moon, as the plane of the Moon's orbit is inclined at a few degrees to that of the ecliptic, as well as being subject to precession".

★★★

How did the astronauts solve their problem? Readers are invited to send in their suggestions. As usual, no prizes for the "winners", but an honorable mention in the next issue of *Gnomon*.

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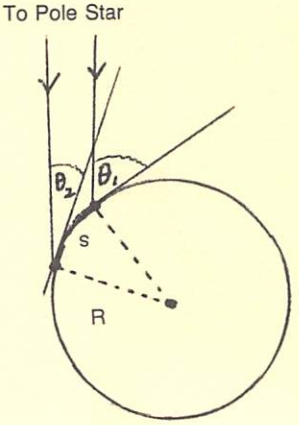
SOLUTION TO GNOBLEM 4

Several readers have sent in suggestions. Boats disappearing over the horizon (the top of the mast being the last to go) are most popular, especially when observed from *another* boat, as the surface of the sea may be regarded as part of a sphere *(land* irregularities such as hills and trees preclude this). Another suggestion, which can lead to an actual measurement of the Earth's radius, is to measure the altitude of the Pole Star (assumed to be at the north celestial pole) at different latitudes. Some simple apparatus to measure this angle is required, and this measurement is made at two stations *on the same geographical meridian* a known distance apart. One can use a map of the British Isles, for example, to find this distance, s. If the two altitudes are θ_1 and θ_2, then the Earth's radius R is given by $R = s/(\theta_1 - \theta_2)$

In this formula θ_1 and θ_2 are measured in radius. If s is in metres, then R will also be in metres.



Such an exercise could provide a link-up between two schools lying on the same meridian, i.e. having the same longitude. We suggest that schools look up an atlas of Britain (or *beyond* these boundaries if possible) and contact other schools on, or close to, the same meridian. This itself would be an interesting exercise; co-operating to find the Earth's radius makes this more interesting. (Measuring the altitude of the Sun *at noon,* using the shadow of a vertical stick, gives rise to a daylight variation).

(Strictly speaking, to show that the Earth is a sphere, we must make measurements in an E–W, as well as an N–S direction – this raises additional problems).

Mr. T. Tinsley of Liphook offers a rather complex solution where pupils stand around a table with their arms outstretched towards the east and west. Their positions round the table correspond to different locations on the Earth, and the pupils move around the table. A commentator then "fakes" the time. Lack of space forbids further details, but interested readers will be put in touch with Mr. Tinsley on receipt of an SAE sent to the Editor.

Ian Ridpath's comments in the last issue on the dates of the latest sunset and earliest sunrise, etc. have evoked some response. Most of these refer to the equation of time, which gives the instant of noon *not* to be midway between sunrise and sunset. But no-one so far has explained why day and night are not equal at the equinoxes!

A UNIVERSAL POINT?