GNOMON

Newsletter of the Association for Astronomy Education

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A grant from The Royal Astronomical Society enables "The Universe in the Classroom", the Newsletter of The Astronomical Society of the Pacific, to be sent to members with issues of "GNOMON".

EDITORIAL COMMENT

Thank you to those who have sent items for GNOMON. Its continued appearance will depend on more coming in so please don't forget GNOMON when you are trying a new classroom activity of evaluating a text book.

There are many inserts with this issue which I hope you will find useful. The AAE realises that lack of GNOMON has been a big problem this year and is confident that this challenge will not arise again. Your editor has no intention of moving house or getting married again in the near future. Please note the new address and name for correspondence.

The AAE now has a general email address. You can send stuff for GNOMON, comments, etc to this email. Remember that the query line is still available for questions too. Use whichever you remember and we'll sort out where your request should go to. The addresses are:

query@ulo.ucl.ac.uk

aae@dial.pipex.com

This issue is being sent to all those who would normally have received the September mailing. If you still haven't renewed your subscription, now is a good time to do so. It will enable us to bring you in one convenient package, any interesting freebies and information in the astronomy education world.

At the next council meeting, we will be discussing our next annual meeting. Any views or opinions about what you would like to see at the meeting and where it would be convenient to hold it are most welcome.

Also, you can meet some of the AAE team at the Association for Science Education conference in Liverpool in January 1998. We will be running some hands-on workshops again. Full details are available from ASE.

Your Editor, and the AAE council would like to wish all members a happy holiday season and a safe and healthy New Year.

Alex Barnett

MEMBERSHIP of the AAE costs £10.00 a year for individual members, £20 for corporate membership and £7 for retired persons. For more information address letters to: AAE, Royal Astronomical Society, Burlington House, Piccadilly, London W1V 0NL. Members receive 4 issues of GNOMON a year.

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

Subscription Rates:

Individual Members	£10.00
Retired Members	£7.00
Corporate Members (e.g. schools, colleges, etc.)	£20.00

Corporate Members will receive three copies of *GNOMON*.

Extra Copies:

0-10	£1.00 per copy
11-50	£0.75 per copy
51-	£0.50 per copy

Back numbers, not less than one year old, half these prices.

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.

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

The Association for Astronomy Education,
The Royal Astronomical Society,
Burlington House, Piccadilly,
LONDON. W1V 0NL.

Editor: Alex Barnett, 43 Second Avenue, Wellingborough, Northants, NN8 3PX email alexbarnett@dial.pipex.com. - for all enquiries concerning the Newsletter. (Tel 01933 443628)

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.

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

Publication Dates:

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

FOR YOUR INFORMATION . . .

AAE Comet Contest
The AAE council met to consider the disappointingly small number of entries for the contest and concluded with regret that none of the entries met a sufficient standard to justify declaration of a winner or to award prizes.

Solar System Scale Model
A couple of issues ago we reported that South Tyneside College Planetarium had constructed a 34km scale model of the solar system and we trying to see whether anything larger had been constructed in the UK before. We are now pleased to announce that their achievement has been officially recognised as the largest in the UK by the Guinness Book of Records! Congratulations to all concerned.

Input for GNOMON
Thanks to all who have responded with offers of help for GNOMON. I will be taking some of you up on these offers. However, I still don't have enough volunteers to provide curriculum material which is the most important part of GNOMON. So, please, if you try something out in the classroom, or have some inspiration (see Eclipses through a collander!) then drop me a line to tell everyone about it.

Rising Stars 1997/8
This schools competition for the London area is well underway. For those unable to take part, you may wish to have a go at one of the qualifying round tasks. All you need is an internet connection and about an hour of time - perhaps a good lunchtime activity or something many children could have a go with at home. Your starting point is the British Association web site. See page 3 for the question sheet.

The Earth and Beyond
Just a reminder that the new version of Earth and Beyond by the AAE, published by ASE is now out. Incase you misplaced your flyer from last time, another one is included with this issue.

PPARC Goodies
Also within this mailing are some goodies from PPARC. We realise that you can contact PPARC directly and ask for these, but we feel that if we get the required number and mail them out with GNOMON then this is one less thing that you have to think about. It has also been pointed out to us that institutions can get Universe in the Classroom free of charge from the Astronomical Society of the Pacific. Again, we are aware of this, but feel that by obtaining a grant from the RAS to enable us to obtain bulk copies and mail them out with GNOMON, it is another less thing for you to think about. We will continue to enclose freebies of interest with GNOMON where we think you will appreciate them. If you need further copies, then you can obviously contact PPARC direct.

Having said this, we were unable to afford to mail out the large teachers pack that goes with the Cassini- Huygens poster. All secondary schools have been sent one so if you haven't seen it, or are not in a secondary school, then contact PPARC directly to have one sent to you. It contains a wide variety of key stage activities and extension activities that have been well thought out and are cross curricular. This mission is going on for many years and is a good opportunity for students to follow the progress of something over their school years. A more detailed report on Cassini will come in a later edition of GNOMON.

More PPARC Goodies
Your school or college should also have received the new glossy 'house' magazine for the astronomy, space and particle physics community, Frontiers. It is packed with information on current research, made accessible for the general reader, news and view and nice colour images. All schools should find it very useful, especially for sixth form reading or for careers use. If you haven't located a copy, you can be added to the mailing list for free to receive this quarterly publication. Write to:

Publicity Team,
PPARC,
Polaris House,
North Star Avenue,
Swindon, SN2 1SZ

giving your name, address and institution. This address can also be used to request any of the other goodies. For a full list of what is available including the Moon Rock and Meteorite loan schemes, see the PPARC web site:

http://www.pparc.ac.uk/

Reviews
GNOMON receives books for review from time to time. If you would like to be added to our reviewers list, please drop the editor a note mentioning particular interests (eg key stage 1&2, general night sky guides, university texts...)

Small Awards Scheme
For any one who missed the October deadline of the small awards scheme for this year, another round will be held in spring next year with a deadline of 10th April 1998. 32% of awards so far have been to schools with awards favouring local or regional pilot schemes.

INTERNET CHALLENGE

Start at the British Association web site

http://www.britassoc.org.uk/.

Go to the BAYS page and look for Rising Stars. From here you will be directed to the first site and the answers to question 1 below. If you get really stuck, email aae@dial.pipex.com for a cheat sheet.

Good Luck!

1) Most of the communication done today goes through one of the largest satellite stations in the world at Goonhilly in Cornwall. Explore the wonders of these vast dishes and answer the following questions:

   a) What are the dishes/antennae at Goonhilly called, and what is the legendary connection between them?

   b) Which antenna, opened in 1972, is reckoned to be the most elegant?

   c) Which antenna goes around a track and can move through an arc of 270 degrees and which direction can it not look in?

2) From this site you should find a animated link to a major event happening in Cornwall soon. From here find out what day of the week it will be?

3) Follow the links to a book of astronomical dates and times to find out the circumstances and times of this event for a town near you and for Falmouth.

4) Then go back to the page that you found following that animated link from Goonhilly and follow the links to a guy at NASA that keeps an awesome set of pages.

5) Follow his links to the Sun and answer the following questions: (You are now on the Nine Planets Site. You should tell your teacher about this huge encyclopaedia)

   a) Find out the name of the spacecraft that is studying the poles of the Sun.
   Now you have this name find out some more about this spacecraft

   b) What planet did this mission use to gravity assist it in its orbit?
   Now you have the name of the planet find the information page on this planet

   c) and find the spacecraft that is named after the father of modern telescopic astronomy and follow the link. Note down the spacecraft's name.

6) Once you have found the information about this spacecraft, you need to find the main Home Page for it.

   a) Once on that site, write down how many days, hours, minutes and seconds it has been since the launch of this craft (this is our way of checking that you went there!)

   b) While on this probe homepage, can you find out what happened to the craft to prevent the data being sent back to Earth properly?

   c) What other two astronomical bodies did the probe photograph on the way?

   d) Why are three dish antennae needed to communicate with the craft and what is this Network called? Where are these dishes situated?

Returning to the main probe homepage, you might want to take a look through the schools resources to find an unusual way of commemorating the launch that is a tradition of the folks at JPL. Once you have located that write or print out the commemorative item that relates to the number 64.

You have reached the end of your journey - well done!

BOOK REVIEWS

"THE PHYSICS OF THE INTERSTELLAR MEDIUM", by J E Dyson and D A Williams

Thank goodness, it's back! Dyson & Williams' little book on the interstellar medium has been the standard introduction to the subject for more undergraduate and postgraduate students than I can shake a stick at, and it has been out of print for years. Now the Institute of Physics have mounted a rescue operation, and its here again. Hurrah!

The book, on its appearance in first edition, filled a yawning gap in a field that is both difficult because it demands understanding of so many different branches of physics, and fascinating for the same reason. The authors, masters of complementary aspects of the subject, ganged up to produce a simple yet thorough introduction, which has stood the test of time and is unmatched.

The topics covered, after an introduction to the Galaxy, are the observational methods, physics of atoms and molecules in space, interstellar dust, and the radiative and gasdynamical processes in HII regions (emission nebulae),supernova explosions, and violent stellar winds. The exposition is rounded off with a study of the way stars form out of this violent environment.

"The Physics of the Interstellar Medium", second edition, is not greatly changed from the original. It is some 30 percent bigger in words, with up to date pictures and references, but is still a slim volume. Enhanced sections include grain physics, shock cooling, magnetic fields in shocks and momentum driven bubbles and bipolar outflows.

The level of exposition is very clear, aimed at a physical sciences undergraduate (which suits a lot of professionals too!).

My only gripe is at the lack of robustness of the book. On second reading, chapter one became a pull-out supplement (and most undergraduates are harder on books than I am!).

Peter Brand ROE

ASTRONOMY OF THE SOUTHERN HEMISPHERE, by Paul Wyatt (Cambridge University Press), ISBN 0 521 43999-X

This book is a must for every school library. Not only is it filled with bright informative pictures and illustrations about the sky at night in and around Sydney, Australia, but its pages contain many project ideas and research questions.

Chapter 2 - Exploring the Planets - gives the teacher in the Northern Hemisphere excellent research projects for all Key Stages and can be fitted into any level. Paul gives three research questions (15, 16, 18) for Southern Hemisphere readers, these can be answered by their counterparts here who can then surf the internet and swap findings. This International Highway is a new way of finding "pen pals", articles for "A" level projects, and creates opportunities for talking with peers about what we are doing to Our Planet and how we can preserve our species.

Being written about "the other side" of our world opens many avenues of discovery. Sight or telescope observations in the Southern Hemisphere are indeed upside down to our Northern tools; especially if you are using traditional star maps. The "star gazer" leaving the Northern world to "go down under" would be well advised to look at the test and research questions at the end of Chaper 3 before embarking on their journey.

"Astronomy for the Southern Hemisphere" makes the sky at night come to life. For instance, Paul Wyatt's view of the "Milky Way" must be awe-inspiring, as its centre passes directly over Australia. After reading each chapter, there are some questions for the reader to test their understanding of what they have read - e.g. *use the index to find the meaning of . . . as used in this text,* ***or*** *choose the section of this chapter which you find most interesting. Justify your choice and write a summary of the section,* ***or*** *the following passage contains a number of mistakes. Note each mistake and rewrite the passage correctly . . .*

The book uses a topic of general interest, to teach basic skills within its theme. The reader cannot help but gain knowledge and enjoyment from its pages.

Paul has been Head of Science at a large High School in Sydney for a number of years. He has used his skills in astrophotography and interests in things heavenly to instil innovative teaching strategies into his school curriculum. He enjoys sharing his experiences with colleagues and students alike through his sky-observing nights and teaching programmes.

Jean Collins

EDWIN HUBBLE: MARINER OF THE NEBULAE, by Gale E. Christianson (1997, Institute of Physics Publishing House, Bristol), price (UK) £19.50 HB, 420 pp ISBN 0 750 304235

Edwin Hubble, of Mount Wilson and Palomar Observatories, was one of the most important figures in astronomy in the 20th century and is remembered for making several of the "breakthrough" discoveries in observational cosmology. These included the first proof (against some remarkably stubborn opposition) that the spiral nebulae were external star systems similar to our Milky Way but located at great distances, the discovery of the expansion of the Universe and the first calibration of the law of redshifts (Hubble's Law, V = H x D), and the classification scheme for galaxies (spirals, ellipticals, and irregulars) which is still in use today with only moderate refinements.

What is truly remarkable is the fact that, despite his celebrity and importance to the history of science, this is the first serious published biography that goes beyond the brief list of facts commonly known about Hubble's career. I am pleased to say that it sets a high standard. Any future biographer will start by reading this book and studying closely the extensive list of unpublished original correspondence and interviews that form much of the basic source material. One is perhaps less surprised that such a book was not previously researched when one learns that Hubble's widow asked that the papers, including her intimate personal journals, not be available for 20 years after Hubble's death from a cerebral haemorrhage in 1953, and then only to a scholarly researcher rather than a popular biographer.

The author succeeds in painting a detailed if not always sympathetic portrait of Hubble the man as well as relating briefly but adequately the scientific achievements and their context in the science of their time. For example, we often hear about Einstein's visits to Pasadena and CalTech in the 1930s, but how many of us knew that it was Hubble that he was mainly interested in visiting?

There are, regrettably, a few errors in the book which could have been avoided by more careful proofreading, but they do not detract from this riveting tale of scientific exploration. As an old Mount Wilson hand of a later generation, I heard many of the stories recited in this book and experienced some of the sights, sounds and smells of astronomical research evoked here. Christianson succeeds in capturing the heady atmosphere of formality and reverence for the great telescopes which permeated the atmosphere of the mountaintop.

I recommend this book to all who are interested in the history of astronomy and the personal lives and conflicts of the great scientists who made the exciting discoveries that form the basis of so much of modern astronomy and cosmology. It is well-written, with a detailed bibliography and a detailed index. The low price and attractive sturdy binding of this volume should put it within the reach of even the most modestly supported school library; it would make an ideal present for the individual with a liking for scientific biography. If no one buys it for you, pick up a copy for yourself.

Dr. Mike Dworetsky,
University College London

BOOK REVIEWS

ORGANIZING SCIENTIFIC MEETINGS BY AUGUST EPPLE. ISBN 0 521 58919 8 Cambridge University Press 1997

In this fascinating book, August Epple shares a lifetime's experience of organising scientific meetings and conferences. He deals with the joys and sorrows of the organising committee from the very first plans to the picking up of the pieces after the show is over.

The first part of the book considers the responsibilities and rewards. The difficulties of setting a budget for administration and the need to allow enough of your own time to do the job well are stressed. Then the practical considerations of the venue, the residential accommodation and the potential transportation problems are reviewed.

In the central section, Epple considers in detail the nature of the lectures and seminars that are the key part of any meeting. There are useful tips on who and who not to invite to speak, on how to get recalcitrant speakers to keep to time in their spoken presentations and to hand in their written copy to meet the publication deadline for the conference proceedings.

Epple does not forget to deal with the all important social side either. The need for an adequate number of coffee serving points for the morning break is just as critical as the selection of a good location for the conference dinner! Many conferences are held in interesting locations and suitable trips have to be arranged for delegates and also possibly their families. Epple mentions how to deal with gate-crashers and also reminds organisers that a banquet of roasted squirrel is not necessarily to everyone's taste!!

Finally, he provides an excellent set of checklists to help anyone still brave enough to be an organiser to make their event a success. This is a specialist subject, well treated. The book is written in a flowing style and would be a good read for anyone who has ever attended a conference.

Alan C Pickwick.

CURRICULUM CORNER

CONSTELLATION PROJECTORS

A simple but effective way of representing the constellations can be made using the foil containers that Chinese take-away food is often served in. Empty containers can be bought, in packs of six, from Tesco's, Sainsbury's and Asda, costing about £1.20. A variety of activities can be pinned on this practical, which can also be made more complex depending on the age group. The activities below were tried with a group of 8-11 yr olds on a science camp. You will need a good star map.

Topics covered in discussions included why the night sky is divided into constellations (to act as a map); constellation patterns being a line of sight effect; and stars being different colours due to their temperature. Vocabulary that had to be simply explained included Red Giants, Variable Stars and Light Years.

Each student picked a constellation in the northern sky and spent some time researching it. They had to find out whether it had any mythology associated with it, whether any of the stars were noticeably coloured or variable and how far away the main stars were. The older children plotted a plan view to show that the stars were at different distances while the younger children illustrated the constellation stories.

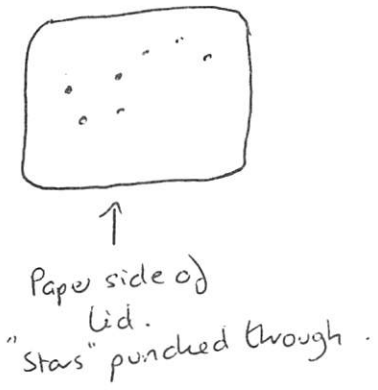
The process of making a constellation projector is simple, and as follows:

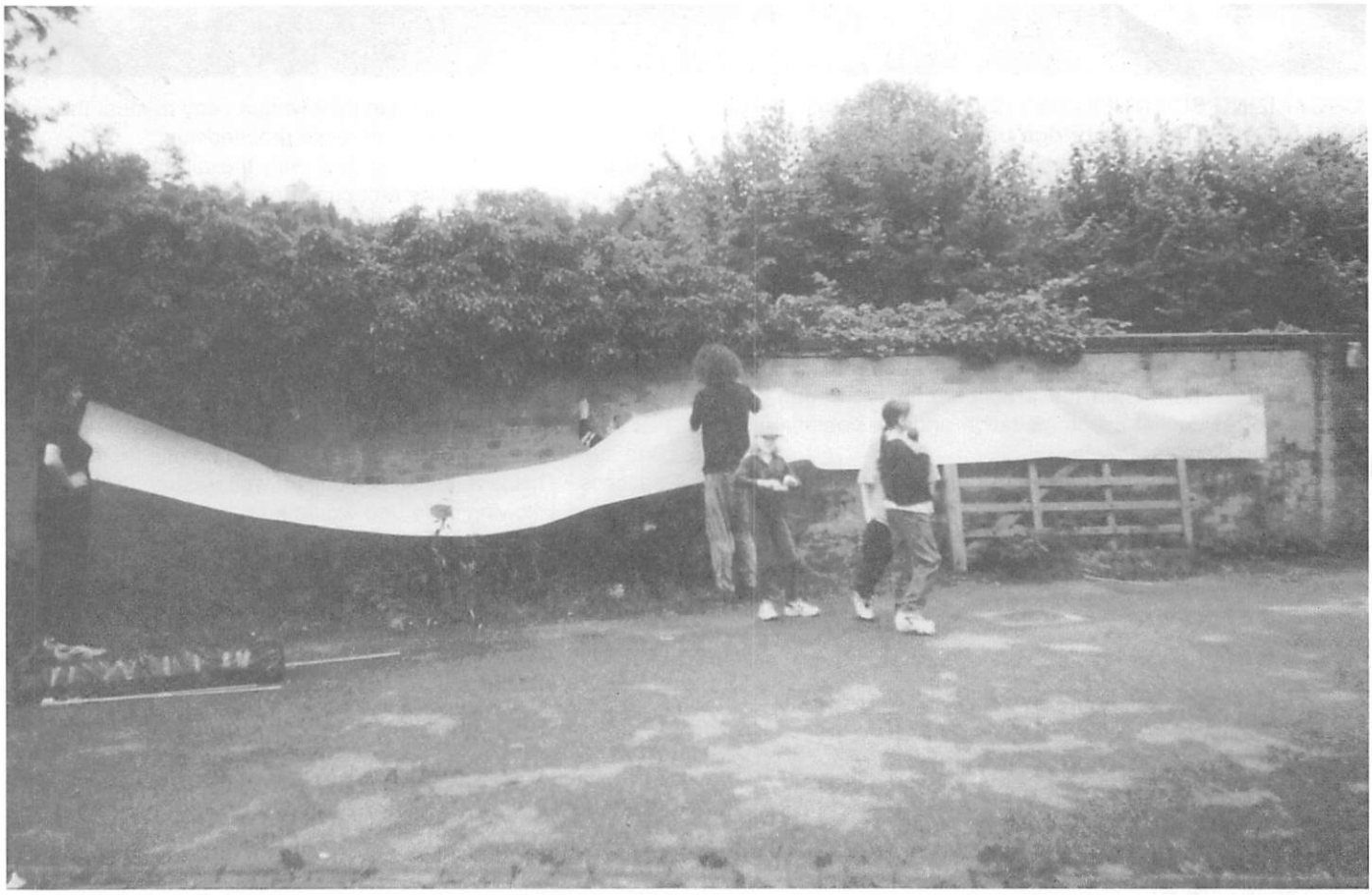
1) Using a piece of tracing paper, trace round the outline of the lid of the container. Make sure your constellation fits within this area, and trace out the positions of the stars.
2) Turn the tracing paper over (this is important or your finished constellation will be the wrong way round, and position it on the paper side of the lid. Go over the stars so that they are marked on the lid.
3) Using a variety of sharp points (from pins to drawing pins) and blu-tack to protect fingers and the table, pierce through the stars using larger pins for the brighter stars.
4) Turn the lid over so that the foil side is facing you and place on top of the container.
5) Cut a hole in the bottom of the container (the foil can be quite sharp so be careful) and shine a flashlight or other light source through.
6) In a dark room, the stars show up very well.

Additional notes:

Coloured stars can be represented quite well. Make a slightly larger hole and tape a piece of coloured cellophane (Quality Street wrappers work well) over the hole.

The bottom of the foil container is large enough to cut a hole to accommodate most usual sizes of torch.





Displaying the solar system at Science Camp '97, Juniper Hall FSC, Doring.

LINING PAPER SOLAR SYSTEM MODEL

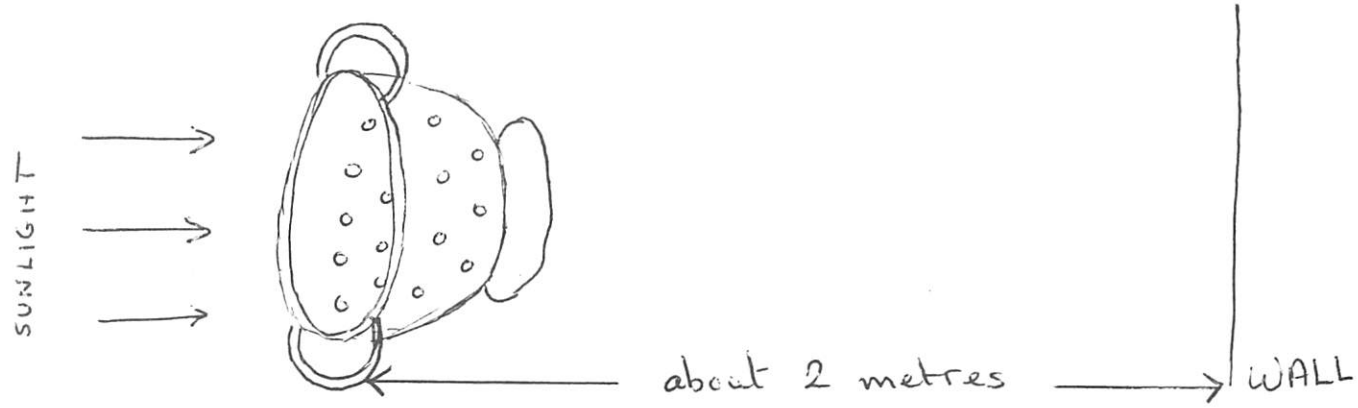
A cheap and easy way of getting students to appreciate the distances between the planets is to use a scale model which the students help construct. In past GNOMONs we have looked at one to construct on a piece of paper wound around a pencil. This is more unwieldy and works well on a sunny day! A roll of 10m of lining paper can be bought from Homebase or another DIY store for about £2.00. As you can see from the photo, the students that made this solar system ignored the relative sizes of the planets and made some colourful ones to stick at the appropriate distances!

Planet	*Distance AU*	*Distance KM*	*Distance Paper (m)*
Sun	na	na	na
Mercury	0.39	58k	0.10
Venus	0.72	108k	0.18
Earth	1.00	150k	0.25
Mars	1.52	228k	0.39
Jupiter	5.20	778k	1.32
Saturn	9.54	1430k	2.42
Uranus	19.2	2870k	4.87
Neptune	30.1	4500k	7.63
Pluto	39.4	5900k	10.00

ECLIPSES THROUGH A COLANDER!

During last October's partial solar eclipse, I happened upon a most unusual instrument for observing. The sky was cloudy and I had given up waiting in the garden with more conventional instruments at the ready. So I went into the kitchen and got on with the washing up. Ten minutes later, of course, the clouds cleared a little and sunlight streamed in through the window. Ever mindful of the advice that you should NEVER look directly at the Sun, but desperate to see how the eclipse was progressing, I reached for the orange plastic colander.

Held sideways in the shaft of sunlight coming through the window, the colander presented 24 "pin-holes" which imaged the Sun. Twenty-four beautifully sharp crescents



were projected onto the wall behind me, each a couple of centimetres across and well separated from each other.

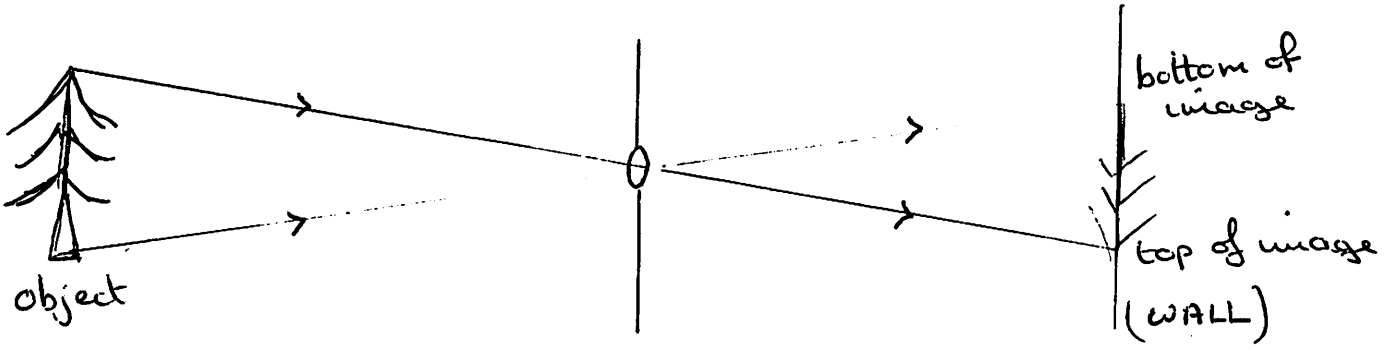
Although a little unconventional, this strikes me as a very easy way to show eclipses to small groups of people. There is no expensive instrumentation, no fiddling to point it at the Sun and no danger of anyone accidentally looking through unattended eyepieces. Almost any colander will do - keep one handy!

NB Why does the colander image the Sun?

Each small hole acts like the pinhole in a "pinhole" camera.

The light rays from the top and the bottom of an object cross over as they go through the hole, so that when they finally fall on a distant wall or screen the have "opened out" again to form a sizeable image. This image is now upside down.

Anne Cohen



U.S.A. REPORT

Welcome to a new, regular column in which I shall share with you some ideas for teaching astronomy in a classroom or planetarium setting for secondary-age children.

In early 1997 I moved from England to Buffalo, New York state for a few years. Having gotten myself thoroughly settled in the area, I contacted a local friend who is the Director of the Maryvale Schools Planetarium in Buffalo. Hers is a six-metre dome housing a rather aged Spitz Nova projector that's bearing up reasonably well. I do regular presentations in the dome and a classroom for grades six and above. (In UK terminology, that's ages 11 and over).

I recently had the idea of having my pupils turn themselves into a human scale model of the solar system in a corridor. I began by showing them a hand-held orrery and using it to demonstrate that the planets don't organise themselves into perfect lines like the kids see in posters and books. I then asked for a volunteer to measure out the scale, and others who would be the Sun, planets and asteroid belt. The scale was 20 million miles to the foot, so 180 feet separated the Sun and Pluto. (Very handy as the corridor was only a fraction longer than this!). The boy acting as the Sun held a yellow disc. Mercury, Venus, Earth and Mars were quite close together compared to the outer planets, so the model was effective in showing the increasingly vast distances between the planets as one travels farther from the Sun. It's quite surprising for them to see that on this scale the Moon is less than an inch from the Earth, and this brings home the sheer enormity of our solar system alone, and puts into perspective media claims that we have conquered space. Should you try it yourself, mention how long sunlight takes to get out to Pluto (about five and a half hours) compared to its eight minute journey to Earth. You could also, perhaps, give each child a card to read out which gives basic data about their planet. I finished off by giving them a few minutes to think of their own mnemonic to memorise the order of planets. A common one over here, thought up by NASA some years ago, is My Very Educated Mother Just Served Us Nine Pizzas.

To give children an idea of the different levels of gravity on each planet in the solar system, fill empty Coke cans with different amounts of sand so the weight of each one is what it would be on respective planets. For example, a can would weigh 2.34 times more on Jupiter than its Earth weight.

To bring home to the kids the fact that the constellation shapes are purely imaginary, I hand out sheets of paper on which are drawn the key stars in some of the familiar patterns, and I ask them to draw their own shapes and make up their own myths. You could also ask them to rearrange the myth behind their own star sign under which they were born (having first of all mentioned, of course, that because of the precession of the equinoxes the Sun is not really in the star sign they think it is in the month of their birthday). This all brings the stars a bit closer to home for them.

I recently tried a little experiment in the dome which seemed to work, and I think it can be transplanted to a classroom environment. There's a heavy emphasis in the USA on making science education fun, and one way of doing this is by bringing pop culture into the learning process, as this piques the pupils' attention. With this in mind, I handed out some index cards on which I'd written some fairly easy astronomy questions. As each pupil gave their answer I'd play a little audio clip on my laptop to indicate if they were right or wrong. A right answer generated a clip of Fred Flintstone saying, "Yabadabadoo!". I didn't have a modern audio clip on my hard drive suitable for a wrong answer (well, perhaps Homer Simpson saying "Doh!"), so I settled for Jim Lovell, Commander of the ill-fated Apollo 13, saying, "Houston, we have a problem".

I will soon be making use of the school's long distance learning centre for some astronomy education. It uses fibre optics to link with three other local schools by video, so I'll let you know in future columns what ideas will work if you, too, have access to a similarly exciting educational tool.

Steve Tidey
Maryvale Schools Planetarium
Buffalo, NY 14225

Sky Diary Winter 1998

GET THOSE BINOCULARS AND CAMERAS OUT

Night Sky for the first quarter of 1998

The map illustrates the sky of 1998 February 15 at midnight. It shows the principal stars and constellations mainly over the southern half of the celestial sphere. The positions of the First Quarters of the Moon on the evenings of February 3 and March 5 are indicated with crosses about 30° apart in Taurus. The First Quarter on January 5th is no shown because it is off the map beyond the westernmost cross.

The visible midnight sky changes as the Earth orbits the Sun, apparently moving westwards, also by about 30° each month, so that the position of the horizon on the map can be estimated for dates other than mid-February. The map is drawn from a vantage point roughly in the middle of England.

The year's first quarter is an excellent time for binocular astronomy. Star clusters such as the Pleiades in Taurus (or the Seven Sisters, the famous faint group found by extending the line of Orion's Belt northwest through, and beyond, the V of Taurus) are best seen in binoculars. Look also for the cluster Praesepe, the Beehive (or Manger - the ancient Chinese astronomers called it "the exhalation of the pile of rotting corpses"!) found in the middle of the faint inverted Y of Cancer (between Gemini, the Twins, and the "Sickle" - a backwards question mark which is the head of Leo and includes the bright star Regulus). Don't forget the Great Nebula at the bottom of Orion's sword which hangs from his belt.

Three much smaller star clusters were listed by Messier in Auriga, the Charioteer, and are much smaller, but still easy enough to find. These are roughly in a line northwest/southeast which straddles one of the five sides of Auriga (the side opposite Capella). Another magnificent star field for binoculars on a clear moonless night is the constellation Coma Berenices. To the naked eye, when conditions are perfect, the elusive glittering of hundreds of faint galaxies and faint stars combine to suggest the shine of Queen Berenice's hair, immortalised among the stars. These clusters, star fields and nebulae also show up well in simple photographs (see below).

Venus will become steadily more brilliant in the morning sky until the end of January, and will be prominent beyond the end of the quarter. There will be a total eclipse of the Sun on February 26, which, alas, will not be seen in the UK. Close approaches in the sky of any two or more bodies, known as conjunctions, are line of sight effects. While they are of no great significance (unless one body actually passes in front of the other, as in eclipses or occultations), conjunctions do provide marvellous subjects for simple astro-photography.

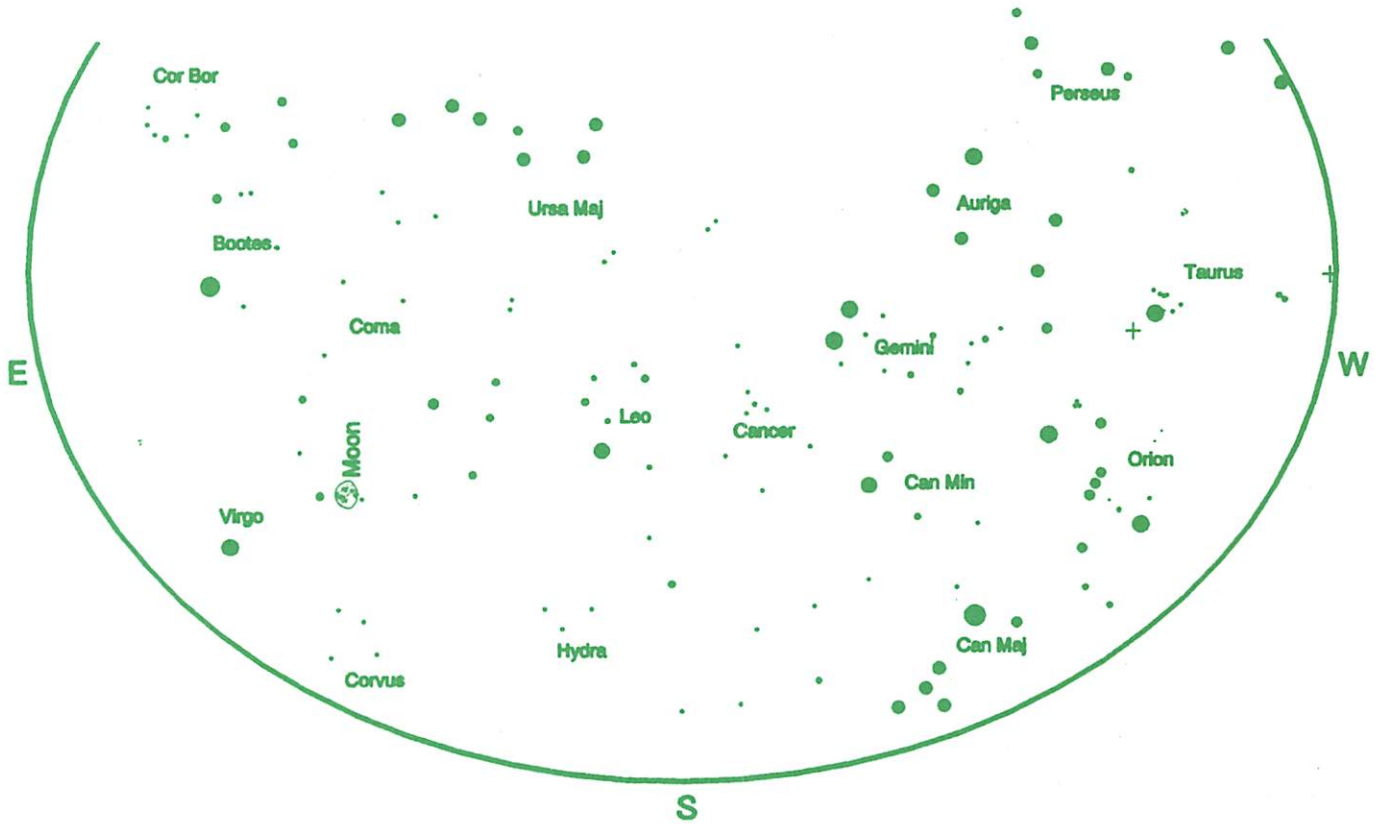
Slides can be made into prints afterwards, and have the advantage that the film is put through a standard process so that what you have photographed is what you get. Negatives are also processed properly, but the prints from these of most astronomical subjects defy the automatic exposure systems of the printing machine. You have to make special arrangements with the processing company to get the right results. SLR cameras give the best results, mounted on a tripod, and preferably using a cable release. Just expose at maximum aperture (f2 or thereabouts) for about 1 second - but experiment with exposures by all means.

Interesting conjunctions occur on January 1 (Moon close to Jupiter - and the faint Mars); January 5 (Moon less than 1/4(S of Saturn); January 24 (Moon and Venus); January 29 (Moon N of Jupiter); March 20 (Mercury at greatest angular distance from the Sun and most easily seen as an "evening star" for the year - it will be 1° S of Jupiter on February 22 and 5(N of Saturn on March 24; also on March 24 the Moon is only 0.1(N of Venus at 19hr GMT.

Richard Knox
Penzance Peripatetic Planetarium

Moon Phases

Month	New Moon	1st Quarter	Full Moon	Last Quarter
January	28	5	12	20
February	26	3	11	19
March	23	1 and 31	9	16



The southern half of the celestial sphere at 1998 February 15d 00.00hrs. The gibbous waning Moon is in Virgo, and the positions of the Moon at First quarter are shown by crosses in Taurus. The brilliant constellations of winter can still be seen through January and February, and later in the night come the reminders of spring, like Leo, Virgo and Bootes.