



GNOMON

Newsletter of the Association for Astronomy Education

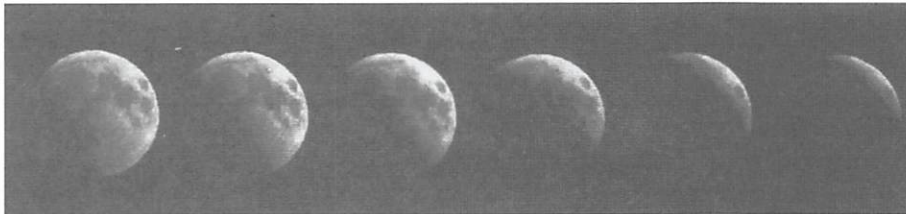
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WINTER 1999/2000

A Happy Christmas, and Best Wishes for 2000

Watch the lunar eclipse on Tyneside



The Moon emerges from total eclipse as seen in the USA and Canada in December 1992. (Taken from the new Armagh Planetarium calendar for 2000 - see "For Your Library", p. 4)

Come to see the total eclipse of the Moon at the Tyneside College Observatory on January 21 (see Sky Diary on page 7). The observatory will open at 3h.00 UT and a programme of slides and planetarium presentations will be provided for freezing observers, culminating in the Eclipse Breakfast around sunrise!

An expanding model universe

Tyneside Planetarium has organised a Solar System Club for schools around the World, with developing countries particularly in mind. An important feature of the club is the expansion of the Planetarium's record-breaking scale model of the Solar System to include the Kuiper Belt and Oort Cloud to a distance of one light year, or thereabouts, by the addition of about 500 comets!

The model (which originally extended only 34km, from South Shields to Hartlepool - i.e. the Sun to Pluto!) has now assumed a World-scale to incorporate the outermost reaches of our Sun's empire. Schools wanting to join the club will find it hard to get further away than

New Zealand where one of the Club's "comets in glass" is located. The comets themselves are to the Solar System model scale, but since this makes them only a millimetre-sized steel ball, the comet is encased in a tear drop-shaped glass paperweight, which suggests the shape of a comet, although taking liberties with the scale. A comet is sent to each new member.

Club member schools are encouraged to develop international pen friends. The club will also encourage visits or exchanges between members. Hurry! There are over 400 comets left still

... new books for a song

Eva also has a large quantity of inexpensive but good quality remaindered astronomy books for sale, also via Tyneside Planetarium. Contact her for details, or send a £5 cheque made out to the "Tyneside College Planetarium" for Eva's own selection of books to that value.

Contact Eva Hans The Planetarium, South Tyneside College, South Shields, NE34 6ET. Tel. 0191 427 3589

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Retired Members	£7.00
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51 +	£0.50 per copy

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

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

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

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Publication Dates:

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

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.

New AS level examination proposed in space science

In the last few months there have been discussions about creating a new AS level course in space science, Alan Pickwick writes. The following points have emerged from the AAE Council and RAS Education Committee work.

- Working in space: the physiology of weightlessness; life support for long journeys; radiation exposure.
- Such a course would be likely to attract large numbers of sixth form students.
- It could attract science and nonscience students alike, which could provide the science counterbalance for artsbased students, and it could encourage students to remain in or take up physics at A2 level. A GNVQ option based on the course might well also be popular.
- A new course at AS level should not draw students away from the EdExcel GCSE Astronomy, which at present has only about 600 candidates per year, so that "space science" is preferred to "astronomy" as a title.

Where possible, the syllabus should build on the National Curriculum. Here are some broad topics that have been proposed:

- The Sun: the life and death of stars.
- The evolution of the planets: satellites and space probes; earthquakes and volcanoes; meteorites, comets and impact craters.
- The Universe: the big bang; distance and red shift; quasars and black holes.
- The search for extraterrestrial intelligence.
- Practical photography of the Moon and stars.

Much of this material is well written up on the internet and so is fertile ground for information and communication technology. Nothing is fixed in stone, so your comments would be welcome. Please address them to:

Alan C Pickwick, 19 Edale Grove, Sale, M33 4RG.
Email: Alan_C_Pickwick@compuserve.com

Eclipse display at ASE meeting

An Association of Science Education conference is to be held in Leeds University, Thursday 6th to Saturday 8th January.

On the Saturday, AAE President Alan Pickwick will be running the "Astrophysics in the sixth form" workshop.

Vice President Francisco Diego will give a lecture "Eclipse 99: A human experience in science, art and education" on Saturday afternoon.

The AAE has requested 20 metres of display space in the members' exhibition area for Eclipse 99 material. Francisco will create the main display and welcomes contributions from ASE Members.

Contact the ASE in Reading to register for the conference.

Water rocket competition

At the General Assembly of the International Astronomical Union, to be held in Manchester in August, Dr John Baruch of Bradford University will organise a water rocket competition. It is likely to be held in the grounds of Manchester Grammar School. For further details, see:

<http://www.brad.ac.uk/acad/cybernet/rockets/chal.htm>

Mills Observatory takes off again

Vice President Eva Hans reports that the Mills Observatory in Dundee is no longer under threat of closure. Thanks to an overwhelming weight of lobbying by worried fans, the observatory has been given a reprieve. It has a new Director, Jeff Lashley, to whom we all extend best wishes for him, and the future success of the observatory. The Grand Reopening is on January 10.

Observations

"HAPPY NEW YEAR" WILL DO!

How many silly examples of being wished "Happy New Millennium" have you come across yet? The Century would be more than enough! This is the time of year when one makes resolutions, such as "I will leave my cigarettes in the 20th Century (what a good idea for a slogan that was!); I will stop correcting everyone who thinks the Millennium will end this December 31; but I'll be blown if I visit the Millennium Dome or the Big Wheel or anything else supposed to mark the Millennium. I will" etc..

I hope, even if way down on your list, but in there somewhere, is the resolution to contribute items to *Gnomon* next year. It's quite easy: just e.mail me at the new e.mail address given on page 1 and let me know about your triumphs and disasters, your tips, experiences out of school and in, visits (see the item about the essay winners on the opposite page) and so on. Then I won't have to fill up the News section with exhortations such as these to get more copy!

2 It was a pleasure to scrap a story that called us all to lobby like mad to save the Dundee Observatory. In

its place is one saying thanks everyone, we did it! In these days when no article is complete without the web site address appended it is comforting to report that people can still do things for themselves.

For example, both Curriculum Corner and *Query* are concerned with the perennial problem of what telescope to buy an astronomically minded child for Christmas. It is important to note that there are still children who want to explore the sky rather than see on television or find it on the Internet. (I am also heartened to note that my spell checker does not recognise the words "e.mail" or "internet", for example). It is not being "old-fashioned" to foresee a growing problem arising from the increasing ease with which one can look up anything and have it fed straight into the senses without having to do much work. Is there a technical term yet for information overexposure?

While admitting that astronomy is of minor importance in schools compared with the basic subjects, it still has an important role to play, especially (as the lead item on this page points out) when young people are usually fascinated with "space science" in its broadest sense. So promote the AAE and its services among your colleagues and make it a happy new many years to come for this association.

Richard Knox

Winning space essay gets girls to Guiana

Kerry Layne and Shanaz Begum, and their school, Haggerston School in Hackney, London, are to be heartily congratulated for providing the winning UK entry to the European Space Agency's XMM (X-Ray Multiple Mirror) Competition. The prize was a trip to French Guiana to see the Ariane launch complex, which lasted over a long weekend of 19th to 23rd November (although the time just shot by!). There were 25 of the girls from the school, including all in the astronomy club, plus some

science group members, and two lucky staff.

The competition was held in all the EU countries, each of which sent a party from the winning school, staggered over a short period, keeping the total number (350 in all) to manageable proportions.

AAE Council Member Sue Flanagan was one of the lucky, and ultimately exhausted teachers, who will let us hear some of the girls' accounts in the next issue. Here is the winning entry.

WHAT'S NEW, MR GALILEO?

By Kerry Layne and Shanaz Begum, Haggerston School, Hackney

The future of space travel and its effects on humanity.

Since the dawn of mankind we have continually conquered the frontiers that face us. The time has now come to move on, so we have begun turning our earliest dreams into reality, the dream that has always fascinated humanity: space exploration.

Since civilisation began, we have been intrigued by the heavens and have wondered about the universe and its origin. Therefore we have always studied science at one of its most ancient and mysterious levels: astronomy. We study the stars to seek answers to the neverending questions that arise.

Astronomical sceptics may ask, "What is the point of studying the stars? They do not relate to our lives in any way." The answer is the same as the reason for studying everything else; it is for the sake of gaining knowledge. It is obvious that humanity thrives on knowledge, achieving it is one of our driving forces.

The Earth is the ideal place to live. Its continents and islands, its oceans, lakes and rivers, support an amazing abundance and variety of life several billion plant and animal species, as well as Man himself, all living in perfect harmony with one another. We have however, advanced and progressed beyond the restrictions of our planet and realise that nothing is eternal. We are now aware that the Earth shall some day become depleted of resources and realise that inevitably we will have to conduct in-depth research into terraforming planets and gaining information about new fuels and materials to ensure our future survival.

One of the reasons that human beings study interstellar space is perhaps to answer one of the most frequently asked questions: "Are we alone?" For decades humans have been sending electronic signals into space searching for other forms of intelligent life. We have always wondered whether there are other life forms similar to ours, and if there are, how could they affect us? No doubt this would have great impact on our views and personal beliefs as well as the general function of our societies.

Studying other planets would enable us to perhaps speculate the future of our world and give us ideas about how to best protect our planet and make our future a brighter one. We can change the way future generations live by discovering new technology and communication facilities, helping us to learn more about Earth and life around us.

By taking one glimpse of the sky at night we are able to identify images we thought we would never see, many stars which appear to be small and vulnerable, trapped in the neverending velvety blackness, yet still managing to glow and reveal their existence. These jewellike heavenly bodies are actually emitting light, which has taken vast amounts of time to reach us, revealing the past. We become united as one nation in our search through the Universe, and so throughout the process learn more about ourselves and our ability to work together in one unified mission despite our cultural differences.

Letters to the Editor

Oops 1

Eric Jackson writes: Upon re-reading through my article "The New Millennium" (Gnomon Vol. 18, No.4) I discovered that some readers may have picked up an error regarding the times that I quoted in relation to Pitt Island. When it is 9 a.m. Monday on Pitt it is 8.15 a.m. (Monday) in New Zealand and 10 a.m. in Samoa - but on *Sunday* (Samoa being 23 hours *behind* New Zealand).

Oops 2!

Mike Dworetzky writes: Query regrets that a typographical error in Gnomon's September issue answer to Steve Ostler, about white dwarf stars, said that "giant hot stars" are at the core of planetary nebulae; this should have read "faint hot stars".

Oops3!!

The Editor writes: While we're all confessing, the box in Ask an Astronomer (last issue) included an error I didn't spot in the AAE's web page address, which is: <http://www.star.ucl.ac.uk/~aaehomep.htm>
Try it, if you have not already done so!

For Your Library

Wonders of the Universe. 2000 Calendar. Armagh Planetarium £9.95 (incl. p.p.)

This is a superb collection of 12 monthly (plus one) photographs, each month with a large page for diary entries each day. Each day includes a review of national holidays, astronomical events, and anniversaries, tips and suggestions. It is compiled by the Hansen Planetarium in the USA, but, happily, is completely international in explaining the visibility of various celestial events. It has become a standard product from Armagh and is a "must" for any reader of *Gnomon*. In addition to new Hubble space telescope and other beautiful photographs, it includes some spectacular views of some of the Earth's "planetary" behaviour (an electrical storm, a hurricane from space and lava flows meet the sea in Hawaii, for example). It also includes such gems as a suggested student astrophotography project related to this coming year's events (see Curriculum Corner) and gives ample warning of many observing and photographic experimental opportunities to come.

Blind Watchers of the Sky. Rocky Kolb. Oxford University Press. 338pp. ISBN 0 19 286203 0 (paperback) £8.99

This book, written by Edward Kolb, Professor of Astronomy and Astrophysics at the University of Chicago, is written under his popular nickname to give an immediate flavour of the easy-reading style of this review of the history of astronomy and cosmology. Even readers with no technical knowledge can enjoy this, and the light-hearted approach may often bring a smile to the reader's lips! Taking his title from a quotation of Tycho Brahe, the theme, as suggested by this title, is not dissimilar from the Arthur Koestler classic *The Sleepwalkers*. Rocky Kolb similarly acknowledges the pivotal roles of Copernicus, Tycho, Kepler, Galileo and Newton at the dawning of modern astronomy, for example. This book has the very important difference of being written by an astronomer. His extensive technical glossary and bibliography would not disgrace a very much more academic work, but Professor Kolb has achieved his objective and, very unusual these days, produced a novel approach to his subject. Excellent value!

Mapping Time E.G. Richards. Oxford University Press. 438pp. ISBN 0 19 286205 7. £8.99.

Dr. Richards, formerly Senior Lecturer at King's College Department of Biophysics, University of London, became an expert in the history and methodology of time measurement, in particular the evolution of calendars, while researching for a computer program to convert between calendars. So here are the definitive answers to the familiar questions: when does the third millennium begin? how do we fix the date of Easter? Was Stonehenge (as Michael Flanders used to say) built "so that you can tell when it's Summer!"?

The result is a very comprehensive book covering calendars as diverse as the ancient Roman, Mayan, and modern Jewish, with most of the religious calendars

and many others. Chapter 1 is launched with the quotation (by Anon.!) "God made the days and nights but man made the calendar", which helps to explain why the evolution of calendars became incredibly complex. The reasons for this, the important but sometimes obscure influences of astronomy, and the mathematics of calendars makes a book that will please and instruct well into the new millennium!

The New World of Mr. Tompkins revised and updated by Russel Stannard. Edited by George Gamow and Russel Stannard. Cambridge University Press. 258pp. ISBN 0 521 63009 6 (hardback) £14.95. *Mr. Tompkins in Paperback.* George Gamow, reprinted 1999. Cambridge University Press. 186pp. ISBN 0 521 44771 2. £7.95.

An inspired double reissue, and a reworking of George Gamow's two famous popularisations of modern (in the 1940's) physics. The original two titles, *Mr. Tompkins in wonderland* and *Mr. Tompkins explores the atom*, have been reprinted in their combined paperback edition to coincide with the new book by Russel Stannard. His skill for science writing for the non-specialist and for children has been put to good use here. He has based his new book exactly (chapter

by chapter) on the original *Mr. Tompkins* adventures, but has brought them up to date.

Mr. Tompkins is a very ordinary man, but he is fascinated by the incomprehensible worlds of relativity, quantum physics, astronomy and so on. He tries his best to improve his education but, alas, has a tendency to nod off without warning. However, this results in fantastic dreams in which his adventures curiously demonstrate the concepts that were alluding him. Read both books for the pleasure of reminding yourself of Gamow's popular style for tackling some of the toughest concepts in science. Then read Stannard's update, continuing the Gamow tradition, and providing a chapter by chapter comparison of the changes that have taken place in fundamental science over the last 50 years.

The 1999 Space Index The British National Space Centre, 151 Buckingham Palace Road, London SW1W 9SS. (020 7215 0807. <http://www.highview.co.uk/space>)

This comprehensive index of resources for all matters concerned with space exploration and astronomy is sent to university and public libraries and careers offices. It is also on the internet (see above). This is how to find your local rocket club, academic courses and lecturers, planetariums, manufacturers of telescopes, film developers or super glue, in fact the classifications range from algorithms to zero gravity. Check out the web site: it will tell you far more!

Richard Knox

Curriculum Corner

So you want to buy a telescope?

It is at this time of the year that thoughts turn towards gifts. Many young people, having been bitten by the space bug through school or the media, decide that they will ask Santa for a telescope. Every year I am approached by parents on this very topic. Most astronomer readers of this newsletter will know exactly what I am going to say but for those readers who are keen to offer the best advice but are at a loss as to what exactly to recommend here are some guidelines.

As with many hobbies, what appears to be a keen interest in astronomy might become a passing fancy. A considerable investment today might result in the need to dispose of a second hand instrument tomorrow, and telescopes are expensive instruments.

The least expensive end of the market will still be of the order of £150 - £250. For this money you will secure a refracting instrument of about 5cm to 8cm aperture. The optics will be good enough for details of the Moon's surface to be clear and for Jupiter's Moons and Saturn's ring system to show up, although expect no detail.

Through a telescope, a star will still just look like a star, and this is perhaps the greatest disappointment young astronomers encounter. However the greatest drawback in the least expensive instruments is usually the mount. These tend to be fiddly to set up and use inferior screw thread systems, resulting in wobble and play which renders the instrument almost useless after a few months unless it is looked after with extreme care. Don't be lured by ridiculous claims of 400 or 500 times magnification (or, even worse, 40000 "areas" magnification!). Far better to have a stable instrument with a magnification of X 60 than a wobbly one trying to achieve X 400.

There is a thriving market in second hand instruments and you might be better off spending your £200 on a second hand reflector. A 12cm or 15cm aperture reflector can be had second hand for this price. See the back pages of the magazine *Astronomy Now* for the second hand ads, and for the main equipment suppliers who also deal in second hand instruments.

The very best advice to be had, in my opinion, is to forget telescopes at this early stage. First spend some cash on a pair of binoculars. You will find that binoculars

are far more portable, more versatile (for other than astronomy uses) and far cheaper for a high quality instrument. I would go to a high street retailer such as Dixons and look at what they have to offer in the range of 8 X 40 to 10 X 50 instruments. You ought to be able to buy a decent pair for under £30.

Don't be lured into buying the super-small compact style binoculars. They just don't collect enough light to make them worthwhile for night time work. The "10 X 50" means ten times magnification and a 50mm diameter objective lens. Such a pair may be heavy for a young person. Perhaps start with a lighter pair at 8 X 40. If you want to spend a little more you can pick up a very good quality 7 X 50 pair for about £70. Avoid zoom binoculars and those with very high magnifications such as 15 x 50.

If it has to be a telescope for you then you might like to hold out until the Astrofest weekend conference held in London in February. Many major retailers are there and they will offer you excellent advice. You will also see some of the cheaper Russian instruments which have more robust mount mechanisms.

Finally it must be said that an instrument, be it a telescope or binoculars, on its own is of limited use. A good star chart or beginners guide to the night sky will be handy to help you locate specific objects and tell you more about the tiny smudges you think you can detect in the distance. See also what *Query* had to say on this subject.

Bob Kibble

A photographic project for 2000

The Armagh Planetarium calendar reviewed on the previous page contains an interesting suggestion for a practical project for the New Year.

The Great Conjunction: Using a 35mm camera with a standard lens (about 50mm focal length), take a series of photographs or slides to record the gathering of Mars, Jupiter and Saturn in the western sky in March and April, and the slow motions of Jupiter and Saturn against the stars of Taurus from July until April 2001.

Use a tripod to steady the camera, and fast film such as Ektachrome 400. Take about two photographs per week when Mars is in the field of view, and two or three per month when only Jupiter and Saturn are in the viewfinder. Exposures of about 20 or 30 seconds with the lens aperture at maximum should be about right.

trying to sell anything; and you would learn how to find objects in the sky, and learn about them. There is a complete list of societies in the UK at:

<http://www.fedastro.demon.co.uk/societies/index.html>

If I were starting out, I would go for a small reflecting telescope rather than a refractor, probably a simple Newtonian design. My own first telescope was of this type and did not even have a sidereal drive to track the stars, but it gave me years of observing enjoyment and I learned my way around the night sky. Few telescopes are "upgradable" (you can't put in a bigger lens or mirror, and adding things like electric motors is expensive although some models allow this) so whatever you get has to

The Things People Ask!

I would appreciate advice on buying a telescope for the first time. I have approx £500 to spend on an instrument. Jim Coffey, school teacher.

There is an excellent source of information on beginner's telescopes at:

<http://www.unet.com/ph/naw96/telescopeguide.htm>

Read this WWW page before doing anything else.

Consider joining a local astronomy society. Society members could be very helpful in the following ways: you could try different telescopes and eyepieces before buying; you would get expert advice from people who are not

satisfy basic requirements. A lot of people seem to spend huge amounts on automated telescopes, but for a beginner a fairly simple one is all you need. The most important things to look for are quality of optics and stability of the mounting. Even the best optics will disappoint if they are mounted on a flimsy stand that vibrates and trembles.

Be very wary of department store telescopes, or mail order telescopes, especially if the ads boast of their high magnification power. This is usually a sure tip-off that they are selling inferior equipment. Astronomers are more interested in light gathering power than magnification. My guess is that you will need to spend at least £300 to get something satisfactory, say a simple 100mm reflector (I have seen ads that suggest it is at least possible). Your somewhat bigger budget seems realistic for a starter.

There are several observatories and planetaria in the UK. If you live near a university or planetarium, you should contact them to find out if they have an observatory you can visit. Many amateur societies also have their own observatories. Use the list mentioned above and find out if the society nearest you has one. Clear skies! **Query** (Query's answer also included some of the same comments made by Bob Kibble on page 5. Consider also a comment on "computer-controlled guidance telescopes", made by a telescope maker. He noted that dialling up many of the objects among the hundreds offered in the telescope's memory banks is doubly frustrating when you look in the eyepiece and see nothing! Not because the telescope is not pointing at what is intended, but simply because it is too faint to see in typical UK skies! And of course automation doesn't help you learn your way about the sky. Ed.)

Where do look to see the northern lights? I live in Cheshire. Neilishy@aol.com.

The aurorae, ("northern lights" in the northern hemisphere), are caused by energetic charged particles from the solar wind hitting the Earth's magnetic field and becoming trapped and focussed into the region around the north geomagnetic pole (NGMP). These particles hit the atmosphere far above the surface, so aurorae are usually seen in a roughly circular zone about 2000km diameter around the NGMP.

Extremely strong solar eruptions can produce exceptional storms of particles that "blow" the magnetic field in such a way that the aurorae can be seen further away from the NGMP than usual, sometimes as far south and east as central and southern England.

The NGMP is currently located in northwest Greenland (it is not the same as the north magnetic pole, which is further west). In general, you should expect displays of northern lights to be visible to the north and northwest of your location. However, strong displays could cover the entire sky. The occurrence of displays is unpredictable, as we never know for sure whether a particular solar eruption of particles will be aimed at Earth or not; the best that can be done is to issue "warnings" of possible increases in activity. These displays are more likely during times near sunspot and solar activity maximum, which is

happening now and for the next two to three years. They are rare in England, perhaps (given our weather) three or four are visible here during the period of maximum activity (out of 1012 that may actually occur). **Query**

I have to teach a short course about the Ancient Greeks and their astronomy and, for the younger ones (8/9 year olds) the myths associated with the constellations. I am having difficulty in finding enough information about the discoveries made by the Greek astronomers. Mary Burrige, school teacher.

Query has some ideas for this topic which can be very stimulating to pupils if you ask them to imagine starting without any knowledge of the shape or size of the Earth or the nature of the heavenly bodies.

Among the principal contributions of ancient Greek astronomers from 500 BC to about 200 AD were the following: proof that the Earth was a sphere, and measurement of its size (Eratosthenes); correct explanations of eclipses of the Sun and Moon; proof by geometry that the Sun was much larger than Earth, and the Moon smaller (Aristarchus); determination of the correct distance to the Moon (within 10% of the modern mean value) from geometry and the study of eclipses of the Moon; theories for the motions of the Sun, Moon and planets which, although physically

wrong, enabled them to predict their positions in the sky with reasonable accuracy; discovery of the precession of the equinoxes. I might add that they adopted for astronomical calculations various calendars which were very accurate, mainly the Egyptian calendar and the Babylonian calendar.

Some Greek astronomers, such as Aristarchus, thought the Sun was at the centre of the Universe, but most believed the Earth was at the centre, and that everything revolved around a stationary Earth.

A brief set of notes can be found at various sites on the Internet, for example:

http://www.phys.virginia.edu/classes/109N/lectures/greek_astro.htm
<http://members.tripod.com/~JFrazz9/asttr.html> (mind the cookies!)
<http://quark.angelo.edu/~msonntag/physics1301/greeks.htm>

Some US college level text books cover these topics in detail, but others are rather skimpy. T. Snow's book *The Dynamic Universe* is good if you can find it. What you want is something from a library on the history of astronomy, or on ancient astronomy. There are so many possible titles that it is difficult to begin to list them; I advise browsing.

How you present the ideas is another matter; a certain amount of geometry is needed, say up to the level of similar triangles and knowing that the angles in a triangle add up to 180°. For comprehending epicycles and deferents, a basic understanding of circle geometry is needed. This won't go down easily with 8 or 9 year olds, so I recommend sticking (with them) to ideas, and maybe a discussion of how you could prove the Earth was round and measure its circumference, followed by asking about correct explanations of the causes of eclipses and doing demonstrations. For older pupils, the proof that the basic reasoning employed by Aristarchus can yield a good estimate of the distance to the Moon can be very pleasing.

Query

Ask an Astronomer

"The Things People Ask!" is selected from the many questions received, and answers given by the Association of Astronomy Education's "Ask and Astronomer" Service conducted by Dr. Mike Dworetzky, University College, London. The service is available to members of the AAE by email: query@ulo.ucl.ac.uk, or via the AAE home page at: <http://www.star.ucl.ac.uk/~aae/aaehomep.htm>.

Celestial spectaculars of the North

The astronomical travel specialists, Explorers Tours, offer an amazing journey that can be thoroughly recommended to view the "northern lights", the aurora borealis. My wife and I, having no total solar eclipse to journey to this year (we live almost on the central line of last August's eclipse), decided to take this trip to central Alaska, in March, together with the optional extension to Hawaii to see the Mauna Kea Observatories, swap stories with *Gnomon's* Hawaiian/Australian correspondent, and see the lava fields of the island. We found that the aurorae are just about as addictive as total solar eclipses.

Explorers Tours take their astronomical advice from Dr. John Mason, who chose the auroral capital of the World, Fairbanks, as the best venue, and March this year, (and for the next year or two), as the best time because the Arctic night is not quite so cold by mid March (about -30°C was the worst we experienced) and at the time of the equinox there are still 12 hours without the Sun in the sky. This and the following two or three years promise good auroral activity as the Sun nears the maximum activity of the 11-year solar cycle.

The particular place for auroral observing was not actually in Fairbanks, but some 50 miles further north at a resort built on one of the chain of natural hot springs which cross this very volcanically active part of our planet. This gives rise to the challenge of bathing outdoors in a pool almost too hot to get into, and cooling down by rolling in the snow. I am told some idiots (sorry!) visitors, do this. I can't say I saw any! The resort, at Chena Hot Springs, caters especially for aurorae watchers with a log-cabin "aurorium" on the side of the hill to the south of the resort. This is equipped with a roaring log fire for the wimps (at that

temperature, that included most of us!)

The display was simply incredible, especially on the second evening. It well reflected in the gasps that came from all sides. It is impossible to describe the variety of shapes, that flashed around the entire sky - including well to the south, where Leo, Gemini and the northern part of Orion still visible above the southern hill tops, were immersed in pulsating green, then yellow, purple and red-dish curtains, writhing skeins of light, and flashing rays spearing up from the horizon. There was Perseus shrouded in dancing light, with Algol at minimum as a bonus for the photograph! Two features of this display were a complete surprise: the maximum brightness, easily bright enough to see the time by your watch, and the speed with which the patterns of light could change and move, writhing across the sky in revolving spirals, rays, curtains and clouds. Just as my wife and I became solar eclipse groupies, so I am sure, we shall be heading north again before too long.

Richard Knox



Sky Diary Winter 2000

The main chart shows the sky looking to the west of south in the middle of February, and showing most of the brilliant winter constellations around Orion, extending from Taurus in the west to Canis Major in the east, and Lepus in the south to Gemini in the north.

The Bull's horns extend from the V of the Hyades to two stars, the southernmost to ζ (zeta) Tauri, and the northern horn to β Tauri. The claim to fame of zeta Tau, is that about 1° to the north west of the star is the first object in Messier's famous catalogue, M1, the "Crab Nebula" (so-called because in the detailed 1844 drawing made by Lord Rosse it looked like a lobster, or even a pineapple!).

It has been said, and it was not that far from the truth not so long ago, that there are two areas of astronomy: the Crab Nebula astronomy, and all the rest. The Crab, is the nearest (6500 light years) supernova remnant about which the date of the original explosion is known (1054AD). It is the home of one of the most intriguing pulsars, the first to show that these super-dense objects "pulsate" at optical wavelengths as well as the radio frequencies. So it has been examined in considerable detail optically and across the spectrum and has probably told us more about the death of giant stars than any other single object. When Messier discovered it (independently - it was first recorded

by John Bevis 27 years earlier) and chose it as the first item in his catalogue, he had no idea that he had picked such a significant object for that honour.

In our light-polluted skies, alas, it is not as easy an object in a telescope as it ought to be, although O'Meara describes it as "surprisingly easy to see with 7 X 50 binoculars" from his site in Hawaii (see *Gnomon* Vol 18 No.4), while Kenneth Glyn Jones over 30 years ago in his book on the Messier objects said "in any but the best conditions it may be quite invisible" - which well illustrates how much profligate lighting has cost us. I would put the object at somewhere between the two descriptions as long as it is being observed in a fairly serious telescope.

Beta Tauri (Elnath) the tip of the Bull's northern horn, falls naturally into the five-sided figure of Auriga, the Charioteer, and is situated on the boundary between the two constellations. Auriga contains three open star clusters which can be seen with the unaided eye in good conditions. To find them, start from Beta Tauri and work along the first of the five sides of the polygon clockwise. The clusters are in a curve crossing this side as shown on the chart. These are beautiful objects in binoculars or moderate telescopes, and turn up easily on photographs of the constellation. In order west to east they are listed in Messier's catalogue as M38, not far from the centre of Auriga, a roughly cruciform shaped group, and the **7**

Approx. rising and setting times: lat. 52N; long 3W

	Jan. 15		Feb. 15		March 15	
	Rise	Set	Rise	Set	Rise	Set
Sun	07h 51m	16h 07m	07h 08m	17h 00m	06h 03m	17h 54m
Mercury	08h 07m	15h 52m	07h 38m	18h 45m	05h 19m	15h 48m
Venus	05h 18m	13h 28m	05h 56m	14h 12m	05h 33m	15h 39m
Mars	09h 39m	20h 13m	08h 17m	20h 27m	06h 55m	20h 39m
Jupiter	11h 01m	00h 40m	09h 09m	23h 04m	07h 22m	21h 39m
Saturn	11h 41m	01h 59m	09h 40m	00h 04m	07h 46m	22h 20m
Uranus	08h 52m	17h 58m	06h 58m	16h 10m	05h 04m	14h 21m
Neptune	08h 18m	16h 55m	06h 23m	15h 03m	04h 27m	13h 11m

faintest of the three; M36, also vaguely cross-shaped, but with the stem of the cross curving gently; and M37, the finest of the three containing hundreds of stars in a compact group.

This part of the sky contains many deep space objects, most of which have been left off the chart this time. The Great Nebula in Orion, M41, could not be ignored, however, and is shown on the chart. This true nebula (cloud) is the nearest major stellar nursery to our Sun, so that it is to emission nebulae/star birth regions what M1 is to supernova remnants. Colour photographs of Orion are very simple to take. Without even tracking the sky a 30 second exposure using a 50mm lens on a 35mm camera set at f2.8 or thereabouts, and focused at infinity, will capture

the Hunter. The nebula will be seen glowing brilliantly red, the reaction of the film to the glowing gases of the nebula, which actually appears greenish in telescopic observations.

This glorious part of the celestial sphere is packed with things to see, but space precludes more detailed coverage this issue. Watch this space!

Events for the quarter are dominated by a curious line up of all the planets in the daytime sky. The table of rising and setting times shows how the planets, and the Sun, rise one after the other in the mid-February mornings. If we included Pluto, it too would be above the horizon during the first half of the morning. Towards the end of the month they are joined by the Moon as well.

Moon phases for the first quarter of 2000

Month	New Moon	First Quarter	Full Moon	Last Quarter
January	6	14	20	28
February	5	12	19	26
March	6	13	19	27

The first month of the new millennium (if you accept that it is!) is marked by a total eclipse of the Moon on January 21. An eclipse for early birds, the first contact with the umbral shadow of the Earth is at 3h 1min 30s UT, and the last contact is at 6h 25min 30s UT. (See also the lead item on

page 1). Totality starts at 4h 4min 37s and lasts for 1 hour and 18 minutes. It is followed (February 5) by the first of four partial eclipses of the Sun in 2000. This is possible due to there being three eclipse "seasons" during the year and the first falls close enough to the start of the year to allow at least part of a third eclipse season to be included at the end of the year, giving six eclipses overall. The last eclipse will be on Christmas Day. (Astrologers and the like: please take note!). Of all six, only the January lunar eclipse will be visible from Britain.

Spectacular conjunctions and line-ups during the period offering many simple photo opportunities, include the closing group of Mars, Jupiter and Saturn which will reach their best in April.

In early February, Mercury will join the evening line-up and the very young waxing Moon make its way past each planet in turn. In March, as Venus finally begins to lose its battle against the approaching morning twilight, it will be joined by Mercury, the two planets being only a little over 2° apart on the 15th and 16th.

Richard Knox

