GNOMON

Newsletter of the Association for Astronomy Education

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Merry Christmas

Proposed New Syllabus for GCSE Astronomy.

Edexcel, the body which provides the astronomy GCSE course in England and Wales has submitted a 78-page draft specification to the Qualifications and Curriculum Authority for a revised GCSE course in Astronomy (1627) for first examination in 2003.

The course has to be revised in response to the latest overhaul of the National Curriculum in May 2000.

There had been some fears that Edexcel wanted to take the opportunity of the revision to drop GCSE Astronomy altogether (see last issue of *Gnomon*). Their argument was that it was uneconomic (with very few candidates) and that there was no differentiation or spread in the results (i.e. all astronomers are clever !).

The proposed course consists ☞

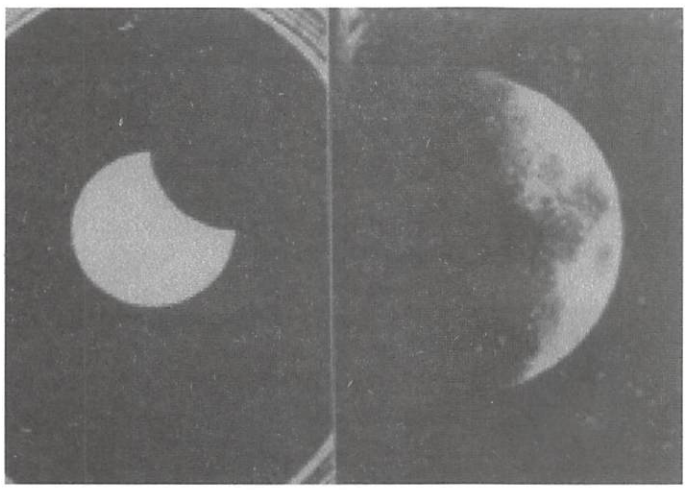
On the net.

If readers come across a new and useful website address, please send it (by e.mail please) to the Editor of *Gnomon* with a very short description of the site. Here's an example.

The Observatorio Astronomico di Padova has launched a website, in English, for teachers, students and surfers in general.

http:///www.pd.astro.it/stars

Called *Catch the Stars in the Net!* the emphasis is on education. Pages include: *Let's discover the face of the moon!,* a short history of lunar observation, with examples: *The Sky at your Fingertips*, a web site for blind people, offering an output to a Braille printer; *The Serravalle Turret Clock,* described as "an amusing story from middle age to Internet"; *The Virtual Planetarium*, an interactive astronomy course: Voyage into the Cosmos, from Galileo Galilei to interplanetary probes; *The Specola Museum*, a tour to the observatory, and (would you believe?) *Ask the Astronomer* - competition for Query? : .



Described as "the first photograph of the Moon", a Daguerreotype produced by Henry Draper in 1863, as displayed on the Padua Observatory website. The top photograph appears to be a partial solar eclipse - but this was not expounded on the web page.

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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.

☞ of one two hour examination worth 75% of the marks and two pieces of coursework worth 25%. The content for the exam is contained in five units: Planet Earth; 2. The Moon and the Sun; 3. The Solar System; 4. Stars and galaxies; 5. Observing techniques and space exploration

The course is provided in one tier (there are no harder and easier papers) producing Grades G to A*. Differentiation is to be achieved by an incline of difficulty within the questions and across the examination paper. In addition, activities in the course work section will provide tasks that reflect differing levels of ability. In the examination, all questions will be compulsory, requiring a variety of responses including structured questions and extended prose answers.

Radical departure

In the course work section a radical departure has been made from the old GCSE course which just required the candidates to keep an observing log. Now the specification gives sixteen tasks to choose two from. The course work tasks are divided into two groups, A. Observations and B. Graphical, Computational and Constructional work.

List A sets out eight tasks, four naked eye projects and four binocular or telescope, from which the candidates have to choose one. List B sets out four graphical and computational tasks and four constructional tasks from which the candidates choose their second piece of course work.The sixteen suggested activities look interesting. They range in complexity to provide for differentiation between weaker and more able candidates.

Thus one suggestion from List B1 (graphical and computational) requires "drawing a large scale chart of the Moon from photographs, marking in and naming prominent features and positions of Apollo and other notable lunar landing sites". This is simple enough, but compare that to the project from List B2 (constructional). "Design and make a model of an eclipsing binary system using a motor, lamps and simple electronic components (e.g. LDR). Obtain measurements for drawing a light curve for the model and compare this to the light curve of a real eclipsing binary system."

In addition to the information about the course content and examination, the draft specification lists six textbooks which are "strongly recommended" for GCSE Astronomy and a full list other materials and contacts. In general the new proposal looks like an improvement on the old course, especially in view of the meatier and more practical course work activities required. It remains to be seen whether it will be accepted as is by the QCA, revised to fit the National Curriculum more closely and whether Edexcel will actually go ahead with it in view of the outcry created by their proposal to scrap GCSE Astronomy in 2002.

Peter Corbally, FAS Education Secretary
peter.corbally@btinternet.com

The threat to GCSE astronomy remains

The new president of the AAE, Francisco Diego has been following carefully the depressing developments threatening the future of astronomy in British schools reported in the last issue of *Gnomon*.

Replying to concerns expressed directly by Bob Mizon and others he said that he was sure that we (the AAE) can combine efforts and not only reverse the situation, but even increase and enhance the importance of astronomy, both in the national curriculum and the GCSE. "GCSE astronomy is not only for schools, but also has great success in adult education. Greenwich and HGSI have regular well attended evening courses" he said.

"I feel the the AAE could help coordinate a wide campaign involving a variety of relevant individuals and institutions. If you like, we could exchange ideas." He went on to say that he had a plan of action involving letters, talks, meetings, public lectures, the media, etc. and suggested in addition, making our feelings known through any useful contacts he and other members may have.

People on the move

● **Steve Tidy**, having worked in Buffalo for three years, has been appointed Astronomy Educator at the Museum of Science and History in Jacksonville, Florida. There is a 210-seat planetarium and a staff of three at the site.

● **Dr Ian Griffin**, at present the Director of the Auckland Observatory and Planetarium, and once at the Armagh Planetarium, has been appointed as Head of the Office of Public Outreach, for the Hubble Space Telescope Science Institute in Baltimore, USA. Ian takes up the new position in January.

Aliens have been found! Competition

Imagine the year is 2020 and you have just heard the amazing and perhaps disturbing news that the first signs of intelligent life have been detected from beyond our planet. The SETI (Search for Extra-Terrestrial Intelligence) team are being very cautious but they think that their radio telescopes have picked up faint signals from a star system about 10 light years away. The Royal Astronomical Society invites groups of pupils to produce a newspaper as if written on that momentous day.

The competition, organised by the RAS Education Committee. is open to groups of pupils in age ranges 7-11, 11-14, 14-16 and 16-19 years. Committed individuals may also enter. There will be a range of superb prizes for the winners of each age group. The closing date 1st May 2001.

For teachers, the highly successful RAS inter-disciplinary newspaper competition has now been running for four years. It is an excellent opportunity to forge cross-curricular links and a real reason to use the internet and your library to search for material. An information sheet is available from:

http://www.ras.org.uk/

or by post (please enclose SAE) from: SETI Competition, Royal Astronomical Society, Burlington House, Piccadilly, London, W1V 0NL.

Spot the gaffes 3

The following is extracted from The Times, 2000 November 25. No prizes for spotting the clangers this time!

Elite club gives astronomers more space (in line with The Times continuing contamination with it's sister Sun 's punning headlines!).

Astronomers will soon be able to study stars in galaxies beyond the Milky Way after Britain agreed to join an elite club that has access to the world's most powerful

Observations

The news may be a little better than in the last issue, but we are not out of the wood yet. Now is clearly the time to put as much pressure on Edexcel as is possible. Even science teachers who are not specialists in astronomy, or even who are not intending to include it in their work more than they can help should be dismayed that it may disappear altogether.

The news this week was excellent for British astronomy (see above, even if *The Times* mucked up their facts!) with the government's announcement that it would increase its funding to the tune of £10 million a year and that Britain would now join ESO and have an important share in the use if the world's most advanced telescopes. But where are the astronomers going to come from? Astronomers without an equivalent national opportunity will be queueing up to get into British astronomy from overseas you can bet! Most professional astronomers at present may have adopted the discipline at their university, but a good many were always keen on the subject. Astronomy is one of the few academic subjects that grabs people at an early age, and at all levels of participation. This passionate interest rarely deserts you, once hooked!

Let's not forget either that astronomers who do leave the discipline are ready for important technical posts throughout industry and academia. So it is fairly clear that we would have many more budding astronomers right now if the subject had been made available at an earlier stage in their education.

It makes no sense, when our government is making an effort at last to upgrade British astronomy, if this is to coincide with the disappearance of the subject from the syllabus!

So, all *Gnomon* readers, lobby like mad in any way you can. Write to Dr. Christina Townsend at Edexcel as suggested in the last issue if you can do nothing else!

Richard Knox

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telescopes. . . . (It goes on to explain how Britain is to support its astronomers in their bid to join the ESO, with an extra funding of £10 million a year - a most important item of news. A pity about the mistakes)

Observatories in the southern hemisphere are also favoured by astronomers, as they offer a more interesting field of view. The centre of the Milky Way is best viewed from there and two of the nearest galaxies never rise above the horizon. .

If that were not bad enough, twice in the same week the addition of the new solar panels to the international space station was described as about to make it the brightest object in the night sky after the Moon and Sirius! The science correspondent should go out and look in the west just after sunset this month. Not to mention the bright body rising in the east when it gets dark.

The Revision of the National Curriculum

The National Curriculum for England and Wales has been revised this year and the new orders come into force in September 2000, replacing the Dearing Revision of 1995. The astronomical aspects of the curriculum have not escaped attention in the revision but have come out of it strengthened if anything, although astronomical matters still only make up about 21 % of the total National Curriculum.

Some of the revisions are merely changes of wording which sharpen the intended focus of the topic. For example in Key Stage Two (ages 7-11), the second statement "Pupils should be taught that the Earth spins around on its own axis, and how day and night are related to this spin" has been changed to "How day and night are related to the spin of the Earth on its own axis". Minor alterations, to be sure, but the new version takes it for granted that the pupils know the Earth spins on its own axis and the emphasis is placed on the formation of day and night.

Three of the five statements in the Key Stage Three Programme of Study (ages 12 -14) have also been changed in the same way ; the effect being to introduce slightly more astronomical content. For example, the third statement has been rewritten from "that gravitational forces determine the movements of planets round the Sun" to "Pupils should be taught about the movements of planets around the Sun and to relate these to gravitational forces". The new wording puts the focus on the orbits of specific planets and Kepler's Laws rather than the vague "planets" in general of the original.

In Key Stage Two the "28 day Moon" has survived the cull; "Pupils should be taught that the Moon takes approximately 28 days to orbit the Earth".

It is in the proposed Key Stage Four Programme of Study (ages 15 -16) that the most substantial revisions have been made. The topics to be studied have been increased from 4 to 5 and vague references to astronomical matters have been fleshed out into specifics. For example the old statement that "Pupils should be taught the relative positions of the Earth, Moon, Sun, planets and other bodies in the Universe" has been replaced with the bolder "the relative positions and sizes of planets, stars and other bodies in the universe (for example, comets, meteors, galaxies, black holes)". So black holes have descended from the realms of Science Fiction and are now compulsory objects in the syllabus of our schools and will feature in examinations for pupils aged 16.

A redrafted statement says that "Pupils should be taught how gravity acts as a force throughout the universe". The old statement had just mentioned gravity in the solar system. Cosmology and cosmogony have also been expanded with the insertion of the word "origin" into the statement that "Pupils should be taught about some ideas used to explain the origin and evolution of the universe". The fifth and completely new statement in Key Stage Four introduces SETI, " Pupils should be taught about the search for evidence of life elsewhere in the universe". But note that pupils are not asked to decide for themselves whether or not aliens exist. The wording puts the emphasis on the science behind SETI. Also education on the subject might help to offset some of Hollywood's wilder flights of fancy.

This revised Key Stage Four Science curriculum is due to come into schools in September 2001 and will be examined for the first time in 2003. The old version of the National Curriculum Science Key ☞

☞ Stage Four from 1995 was never properly introduced because the Exam Boards fought it off and retained their GCSE's.

I have a written an FAS guide to the astronomical aspects of the National Curriculum for our member societies. The booklet has been held up by the late publication of the revised curriculum (May 2000) but should be available from the FAS Autumn Convention onwards.

Peter Corbally FAS Education Secretary

Letter to the Editor

During November, while working in some schools in the United States, I had the opportunity of e.mailing a school in New Zealand from a year 6 classroom of Willow Ridge Elementary School, Buffalo, USA.

Children in the class understood time zones across the United States but were fascinated by the idea that my email was to "tomorrow" as it was going to New Zealand 18 hours ahead of their time and the reply from New Zealand was to "yesterday". The next surprise was that somewhere else in the world summer was coming when they were experiencing shortening days and chilling weather.

This stimulated questions as to what was causing this to happen. I told the children that our Christmas dinner was a barbecue at the beach and Christmas pudding was ice-cream and strawberries. The result of this is the opportunity for children to e.mail to classrooms in other places around the world.

Initially the idea was to exchange comparative observations, recordings and activities with their Pipehenges, but I expect it will be much wider than that once contact between schools is established. I have been told by the teachers involved that this interchange opened up many new ideas to the children and encouraged them to further questioning and personal research on how seasons occur, how time is determined, how the lengthening of shadows is related to the declining height of the sun at noon. Who said that astronomy was boring?

If any UK schools are interested in joining the e.mail exchange I would be happy to arrange for the exchange of e.mail addresses in New Zealand, Australia and across the United States.

Eric Jackson.
pipeheng@voyager.co.nz

Lunar eclipse competition

Don't forget the total lunar eclipse on January 9 (see *Sky Diary* in this issue). South Tyneside College Planetarium and Observatory is running a competition for schools.

Send your entries to The Planetarium, South Tyneside College, St. George's Avenue, South Shields, Tyne and Wear NE34 6ET ☎0191 427 3589)

- Infant Schools: make a fantasy Moon from a paper plate
- Primary Junior Schools: make a model of a lunar station.
- Secondary Schools: Take a photograph of the Moon.

Entries must reach the College by 2001 January 8 so that prizes can be awarded at the eclipse watch on that Tuesday evening and the winning entries exhibited.

Curriculum Corner

TIME AT ANY TIME (PART 2)

In the last issue we saw how to use the human hand as a rough sundial to tell time by the Sun, or better still, to find our way by the position of the Sun by using our hand as a sundial. At night we have to use more distant suns, in particular a star that is, fortuitously, roughly at the same celestial longitude as the Vernal Equinox.

Astronomical observatories use sidereal time and astronomical clocks such as the ones in York Minster, Hampton Court, Strasbourg Cathedral and others, also display sidereal time. This is, put simply, time defined by the local position of the stars rather than that of the Sun.

Instead of defining the hour "zero" as the moment the imaginary mean Sun is due north, the zero for sidereal time is the moment the true vernal equinox is due south. Both solar and sidereal time then give the time elapsed since their respective zero moments, called an hour angle.

The longitudinal position of astronomical bodies on the imaginary celestial sphere that surrounds planet Earth is measured in 24 divisions of 15° called *right ascension*, and measured in hours eastwards from the vernal equinox. Since the vernal equinox marks the zero of sidereal time, the time since the equinoctial transit is its hour angle, and is also shown by the right ascension on the observer's meridian.

The Sun's right ascension at the autumnal equinox is 12 hours. So at 12 hours local solar time, when the Sun is due south on the observer's meridian, the sidereal time must also be 12 hours. Thereafter, due to the Sun's apparent easterly motion along the ecliptic by nearly 1 degree each day, the Sun reaches the meridian nearly 4 minutes later than the day before.

So a rough rule is that the sidereal clock will "gain" about 4 minutes per day, or half an hour per week, or two hours per month, or 24 hours per year, measured by our watches.

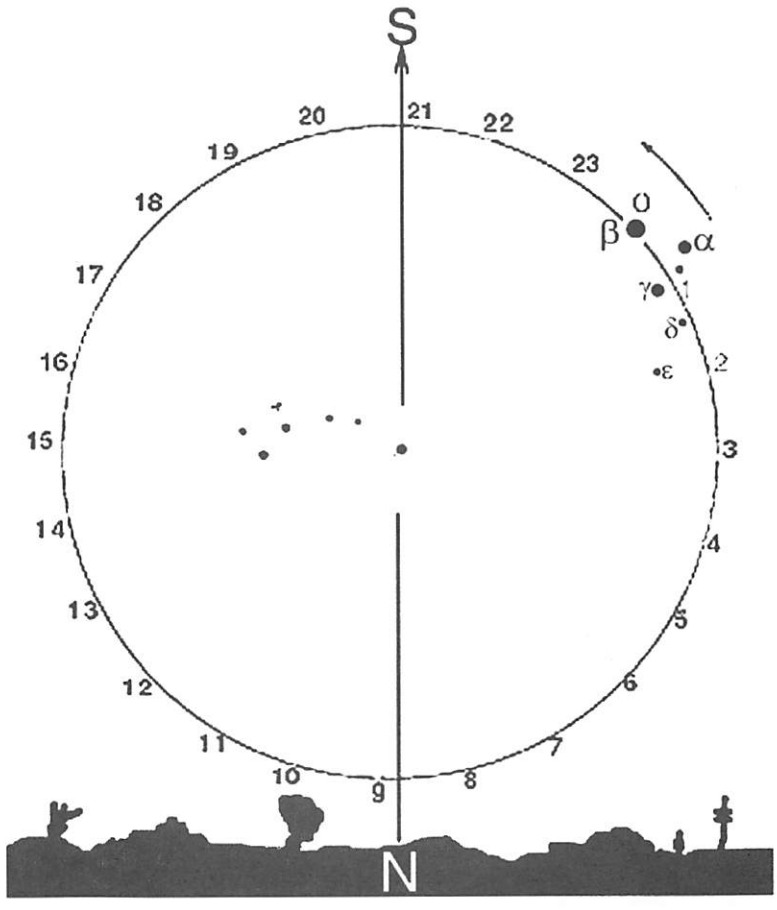
We now need to find the star beta Cassiopeiae in the sky. Cassiopeia is always visible at British latitudes (assuming a starry night) somewhere round the celestial pole. The brightest star in the W - beta Cassiopeiae (β Cas.) is at one end of the W, and is called "Caph". The star at the other end of the W is much fainter. Beta is very useful for

The astronomical clock in York Minster shows the present appearance of the sky, with mean solar and sidereal time.

our purposes because it has a right ascension of close to zero hours. So when Caph is immediately above Polaris (almost overhead in Britain), the star is on the meridian in southern transit so the sidereal time is zero hours. One hour later, for example, it will have moved 15° to the west of the meridian, and the sidereal time will be 1 hour, and so on.

If we imagine a circular disc marked in 24 hours (clockwise) which rotates about Polaris anticlockwise (shown by the arrow above Caph in the diagram), we are imagining the meridians of right ascension as they radiate from the pole (just as the meridians of longitude radiate from the Earth's Poles.) It is also how the northern polar region, Maps 1&2 are shown in *Norton's Star Atlas*). We can then estimate the value of right ascension on the meridian *above* the pole. In the diagram, for example, it is about 20 hours 50 minutes. (We use the same type of rotating dial clock in many domestic central-heating timer systems.)

All we need to do now is work out how fast this sidereal clock is compared with our watches and "correct" accordingly to give the local mean solar time. (You would also have to correct the local mean time for your longitude relative to the prime meridian in your time zone by adding 4 minutes per degree west, or subtracting the same per degree east of the prime meridian – such as Greenwich in the UK).



For example, if the position of Caph is as shown in the diagram on June 10, the sidereal clock has been gaining over eight months (i.e. 16 hours fast) and two weeks (one hour) and 3 days (12 minutes); a total gain of 17 hours 12 minutes. The local sidereal time, from Caph's position, is 20 hours 50 minutes, so the local mean solar time is 20h 50min minus 17h 12min, giving 3 hours 38 minutes. If you made this observation in Penzance at longitude 5° west, the time on your watch will be close to 3h 38min plus 20 minutes, i.e. 4h 8min.

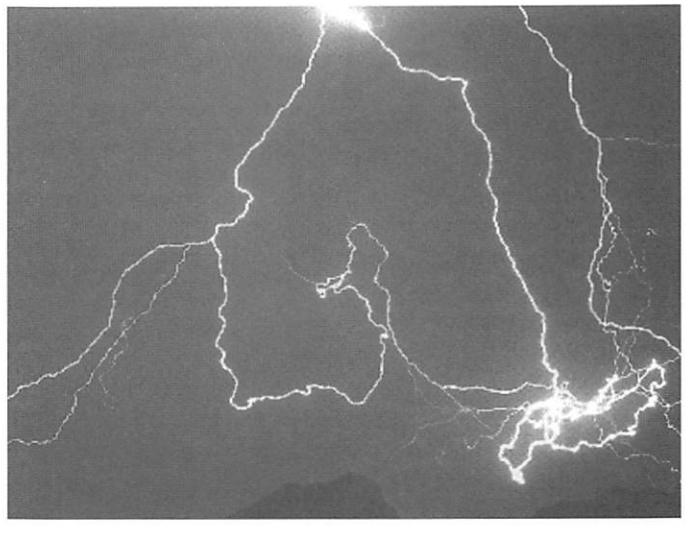
Richard Knox

For Your Library

Wonders of the Universe and *Earth From Space*. 2001 calendar. Armagh Planetarium. £9.95 each.

The amazing astronomical calendar prepared in the USA by the Hansen Planetarium and available as usual from Armagh is as wonderful as ever. This year, one is spoilt for choice with a second calendar. Actually, even the *Wonders of the Universe* has a distinct bias towards planet Earth, with eight out of the 13 mini-posters being of our home planet. This in no way detracts from the astronomical theme, however, because the selection helps promote a conception of the Earth as a planet.

Wonders ...opens with a Frontispiece of the Earth and Moon which is worth the price of the calendar alone. An incredible computer-enhanced view of North America (where else?) with hurricane Linda beautifully depicted off the west coast of Mexico reflects the special imaging techniques used in the surveys of the surface of Venus for the Magellan mission. Then close up examples of the nature of the planet are reproduced in detail, including a view inside the Kilauea vent, the active crater on Mauna Loa, Hawaii.



A lightning storm in Arizona (reproduced here in monochrome) is a spectacular example of the work of atmospheric research and the techniques being developed to capture data for such studies.

Sonar is used in Earth's areas covered in water, just as radar was used to map the perpetually invisible surface of Venus. The bottom of Lake Tahoe,

☞ pictured in the calendar, is reminiscent of the Venus photographs, and demonstrates the high resolutions now possible.

Add to these the pictures of Mars, Venus, galaxies and nebulae that make up the contents and you have another collection of pictures, all worth framing. But in addition, the calendar is full of daily information on what is happening in the sky, astronomical and astronautical anniversaries, holidays for most countries, a monthly review of the sky at night, and much more. A "must have" (and great for your Christmas list!).

The Earth from Space provides plenty of competition, with 12 magnificent photographs, mostly taken during Space Shuttle missions. The views of volcanos, canyons, deserts, ridges, water courses and other features draw attention to the similarities to features on other Solar System bodies. The Earth has, after all, been heavily scarred by impact craters that have remained hidden and unrecognised on the surface of the Earth until such long-distance, all-encompassing views were possible. The daily information is more traditional - lunar phases (to Eastern Standard Time) public holidays (international) and so on. An essential addition to any geography room.

There is also a splendidly produced new Armagh planetarium catalogue full of goodies.

RK

Secrets of the Universe. A loose-leaf encyclopaedia that builds up in monthly instalments in eight classified sections, fitted into ring-binders (provided). International Masters Publishers. £4.99 per month, until you cancel, or the Sun becomes a red giant star.

Described as "Your guide to the Cosmos - and beyond" you might be forgiven for expecting a supernatural element to be included! This new venture is by the same publisher that uses the same monthly delivery technique to provide *At home with your PC*. As with the computer publication, the publication builds up a sort of world of its own, so popularised that it becomes out of touch with reality!

The newcomer is wooed by a promise of a free star-gazers kit that is worth £9.95! (the publisher's exclamation mark). It is, in fact worth less (or should that be worthless?). It comprises a pocket compass that appears to have come out of a Christmas cracker, a star map (covering both hemispheres) and a tiny planisphere. The star map appears to be a random pattern of dots in which single line outlines of constellations have been added in roughly their position on the celestial sphere. One wonders what all the other dots do! The planisphere actually provides a better star map - but you'll need a magnifying glass to see it at all!

There are gross inaccuracies through all the pages, a good deal of gee whizz speculation, much of which is already out of date, and a poor approach to the subject. Small details abound with errors. Imperial units are used throughout (temperature of the centre of the Sun 27 million ^{0}F!), and numbers are ambiguous and unreliable (in astronomy numbers are hard enough at the best of times, but how about the mass of the Sun = "1.99 million trillion trillion tons" which, if a "trillion" is 10^{12}, is in error by a factor of only 1016.5, and if a "trillion" is 10^{18}, then the error is only a hundred billion times greater - I think!).

Enough said. Don't get this one.

Richard Knox

THE THINGS PEOPLE ASK!

As part of my Bed primary course we are required to develop our own subject knowledge on the solar system. One of the tasks assigned to the course is to study and record the Moon's changes across a lunar month. In particular we are required to sketch what we see and identify its position in the sky. Any information advice or resources that you could supply to help would be gratefully received as I am a complete novice! Wendy Steward (teacher in training) asked.

This is a standard (and very good) early scientific project used in the UK National Curriculum for primary pupils. It teaches the need to make careful records over a period of time in order to study a natural phenomenon. It also teaches patience and persistence! And at the end of it all, pupils actually do gain a better understanding of the monthly variation of the Moon. Clouds and lack of persistence are the main problems.

Many people do not realise it, but the Moon can also be seen quite well in full daylight, as long as the sky is reasonably clear and it is well above the horizon. The best way to see this is to realise that it can be seen and then look for it. Evening observations of the crescent `New' Moon through Full Moon and somewhat beyond can be made at night, but at still later phases it is unreasonable to expect children to stay awake for moonrise. But, during the second week after full moon your observations of the waning crescent can be made in the early morning hours, or in daylight.

Your drawings should make allowance for the fact that the Moon would appear to be in different orientations but that is a minor problem. magnetic compass could be used to determine the approximate direction of the Moon at the time of observation (the time should also be recorded).

It usually will not be overhead, so make some estimate of the elevation angle of the Moon taking the horizon to be 00 and overhead 900 (Small children would not usually apply this much sophistication.) You should draw what is seen to the best of your ability, including daylight sightings. It would be important to record the time of each drawing as well as the date. Then, the observed phases could be plotted with their date and time of observation.

You should also try to note the way in which the crescent is orientated with respect to the Sun. Does the illuminated side face towards the Sun or away from it? Best of luck with the project, and here is wishing you some clear skies!

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 Dworetsky, University College, London. *Query* reminds senders of e.mail that plain text format is preferred, not Microsoft Word documents which can transmit computer viruses. The service is available to members of the AAE by e.mail:
query@ulo.ucl.ac.uk, or via the AAE home page:
http://www.star.ucl.ac.uk/~aae/aaehomep.htm.

LETTER FROM DOWN UNDER

On a recent trip back home to New Zealand, I had the opportunity to catch up on astronomical developments in that other country "Down Under". The Department of Physics and Astronomy at the University of Canterbury in Christchurch is the largest group in New Zealand carrying out astronomical research. The department owns and operates the Mt. John University Observatory (MJUO) which overlooks Lake Tekapo in the scenic Mackenzie country of the South Island, about 3 hour's drive from Christchurch.

The MJUO facilities include the McLellan 1 metre telescope (built by the department in 1986), plus two 0.6 metre telescopes, and assorted astrographs and cameras for wide-field photography.

The instrumentation consists of an echelle high-resolution spectrograph (fed by an optical fibre), a medium resolution spectrograph, a 1k x 1k CCD, as well as single- and dual-channel photometers.

The main research focus of the group is in stellar astrophysics, particularly the study of long-period variables and eclipsing binary stars. A new fibre-fed echelle spectrograph (HERCULES), which sits within a vacuum tank and offers very high stability, is under construction in the department workshops. When completed in early 2001, it will be used to carry out a search for planets around nearby southern stars, by looking for very small (a few metres per second) radial velocity changes caused in the parent star by the gravitational tug of the planet.

The University of Canterbury has pulled off a major coup by securing funding to allow it to become a partner in the Southern African Large Telescope (SALT). This 10 metre telescope, now under construction at the Sutherland Observatory in South Africa, is based on the pioneering Hobby-Eberly telescope recently completed in Texas. SALT uses segmented mirrors mounted on a rotating frame to collect light, but instead of being fully steerable, it relies on the ability to track a source for up to 2 hours as it drifts through the field of view.

The University of Canterbury joins a consortium of South African, American, German, Polish, and UK universities in contributing funding and instrumentation for SALT, which will be one of the world's largest telescopes when completed in 2004. The ability of SALT to carry out monitoring observances of sources over long time periods (days to months) in service (or "queue") mode will be especially valuable to the researchers at the University of Canterbury.

A small group at Victoria University in Wellington also carries out astronomical research, principally in multi-wavelength studies of galaxies, as well as involvement in WET (the Whole Earth Telescope), a collaboration of astronomers who coordinate observations to enable continuous 24-hour monitoring of variable stars and cataclysmic variables).

Victoria also collaborates with the Universities of Auckland and Canterbury, together with several Japanese universities, in the MOA project. MOA stands for "Microlensing Observations in Astrophysics" (but also refers to a large flightless New Zealand bird, now extinct!), and uses a CCD camera with 6000 x 4000 pixels on one of the MJUO 0.6 metre telescopes. The primary goal of MOA is to detect microlensing events towards the Magellanic Clouds and the Galactic Bulge, in which the light from a background star is briefly magnified by the gravitational influence of a passing massive object (possibly a lump of dark matter) across the line of sight.

While such events are important for constraining the nature of dark matter in the halo of our galaxy, a potential spinoff is the telltale signature in the light curve of a planet orbiting the background star. The MOA group have already found one candidate planet around a star in the bulge of our galaxy, and are continuing the search for more.

New Zealand has always enjoyed close and productive partnerships between professional and amateur astronomers. The Variable Star Section of the Royal Astronomical Society of New Zealand, led by Frank Bateson, has amassed over 4 million visual observations of variable stars since 1917, which provides a significant database for researchers to draw upon. In addition, amateurs make valuable contributions in other areas, including aurorae, comets, photoelectric photometry, and lunar occultations.

Considering its small size (3.8 million people), New Zealand produces an impressive and diverse range of astronomical research, and with its entry into SALT, is poised to join the "premier league" of astronomy.

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SKY DIARY WINTER 2001

Highlights of this quarter will be the eclipse of the Moon on January 9 (check up on your Spode's Law); the brilliant evening elongation of Venus, shrinking rapidly in March as inferior conjunction (March 30) approaches; and the northern Spring Equinox on March 20th.

The Moon will be immersed in the northern half of the Earth's shadow during the mid-evening of January 9. Mid eclipse is just before 20:19 UT, totality lasting from 19:49 to 20:51. The northernmost limb of the Moon will only just be in the umbral part of the Earth's shadow, so we can expect some interesting colours and shading of the eclipsed Moon. Being a mid-evening eclipse, students can be encouraged to observe the event with whatever means is available to them, making the appropriate and detailed timings and records. There are also many opportunities for practical experiments.

Photography is an obvious one, using a range of maximum aperture exposures from 1/60 second to 5 seconds close to and during totality (depending on the film type and speed - but try other exposures). Most satisfying of all is a multiple exposure showing the progress of the eclipse as the Moon rises, recording the partial as well as the total phase. This needs either a camera that can be set to give multiple exposures, or a manual "shutter" that can be made from various bits and pieces. The shutter is, in fact, a box, made to resist the ingress of light as much as possible (matt black inside etc.) with an aperture that can be opened very briefly.

The shutter substitute can be as crude as an empty

Approx. rising and setting times: lat. 52N; long 3W						
	January 15		February 15		March 15	
	Rise	Set	Rise	Set	Rise	Set
Sun	08h 12m	16h 30m	07h 26m	17h 26m	06h 26m	18h 16m
Mercury	09h 03m	17h 25m	06h 54m	17h 05m	05h 48m	15h 34m
Venus	10h 04m	20h 52m	08h 20m	21h 40m	06h 12m	20h 45m
Mars	02h 31m	12h 02m	02h 04m	10h 39m	01h 29m	09h 32m
Jupiter	12h 40m	04h 24m	10h 39m	02h 26m	08h 56m	00h 52m
Saturn	12h 30m	03h 37m	10h 28m	01h 37m	08h 38m	23h 54m
Uranus	09h 24m	18h 43m	07h 22m	16h 47m	05h 35m	15h 06m
Neptune	08h 46m	17h 30m	06h 44m	15h 30m	04h 56m	13h 45m

shoe box with an aperture cut in the base, the aperture being covered with a gravity-operated slide with a small slit in it. Alternatively a rotating shutter can be devised with an elastic band to apply tension to the axle.

Multiple exposures must be carried out from a very dark environment, and the hardest aspect of the construction is devising a "shutter" that keeps light out between exposures, since the camera shutter must be left open throughout the exercise, and the camera must not be touched during the exposure. The experiment is also a test of engineering ingenuity!

Lunar eclipses provide an ideal opportunity to ask questions of the students such as: why does the Moon not disappear completely? (It does not, usually - so why does it disappear at some lunar eclipses?); why does it go a red colour? What would we see if we were standing on the surface of the Moon during the eclipse? (The artistically inclined could be asked to produce a painting to answer the question). Why are eclipses of the Moon seen so often compared with eclipses of the Sun?

Jupiter and Saturn remain fairly close together (within 8 - 10 degrees) throughout the quarter in the evening sky, and by the end of March they will be in the western sky at dusk, though still around for some six weeks into the Spring before disappearing in the twilight. Mercury's nearest to a Spring evening elongation, normally the best of the year is at the end of January and not as good as it might be. Mars is in the morning sky, low in the sky as it moves from Virgo along the ecliptic into Scorpius.

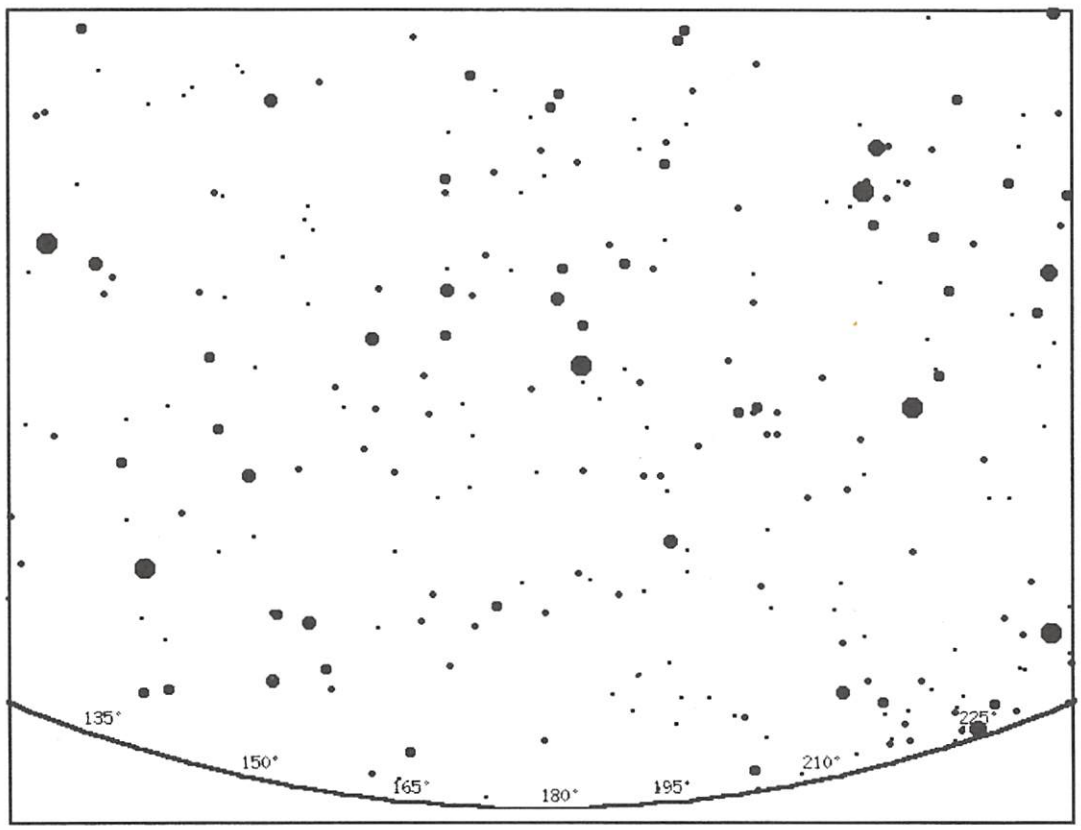
The chart shows part of the sky approximately south at midnight in the middle of the quarter, from a position roughly in the middle of the UK. Leo dominates the southern aspect of the midnight sky. Leo is (perhaps) one of the best large constellations that looks something like the image assigned to it by the ancient astrologers, although I find Leo more like the lions that guard the base of Nelson's Column in Trafalgar Square, that is lying down, with forepaws stretched out in front. Ancient star maps suggest a more rampant pose.

To the west of Leo is Gemini, two straggly trains of stars, roughly parallel, which are crowned in the east by the bright pair Castor and Pollux. For those who do not believe stars are of different colours (like all the special effects men in Holywood) use the Twins as a test for your students. Which is the brighter star? The Twins are far from being the same.

Between the two bright zodiacal constellations is triangle of faint stars marking the join of the three arms of the Y. In this triangle is the brilliant naked eye star cluster Praesepe, the Beehive. You can see why it looks like a swarm of bees, but why did the ancient Chinese call it the *Exhalations of the pile of rotting corpses*? This is a wonderful object in a simple photograph, taken with standard lens at full aperture with a 30 second exposure (or more if you are able to track the sky).

Richard Knox

Moon phases for the first quarter of 2001				
Month	New Moon	First Quarter	Full Moon	Last Quarter
January	24	2	9	16
February	23	1	8	15
March	25	3	9	16



Looking south from about the middle of England on 2001 February 15 at midnight. Leo can be seen just above the centre of the chart. In the north-west corner is Gemini. Arcturus (in the north-east area) is the brightest star in the northern hemisphere, and Spica, in Virgo, is in the south eastern corner.