



GNOMON

Newsletter of the Association for Astronomy Education

Vol. 21 No. 1

ISSN 0952-326X

AUTUMN 2001

The Department of Education and Skills?

I am still awaiting confirmation and fuller details of the latest bright idea to emerge from the right hand (the one that has never heard of the left hand) in the Department of Education and Skills (note the latter new word, by the way). From the end of next year (we're talking 18 months), all tutors involved in adult education ("evening classes", they used to be called) will have to have a teaching qualification. The City and Guilds 7307 or its equivalent will be mandatory.

The definitions of education are legion, so there is no point in quibbling about the meaning of "adult education". Suffice to say that it can be assumed that it involves a wide range of demands by students, ranging from needing a qualification that is academic or vocationally oriented, to wanting an interesting evening out. In between is a whole range of examinations to be prepared for, and an even wider range of skills, hobbies and pastimes to be enhanced. *(continued on page 2.)*

Hubble making waves

A handful of BAP members will recall a trip to Garching, near Munich, to the headquarters of the European Space

Agency opportunity to operate a telescope in Chile in real time from a keyboard in Munich, looking for blue stars in a galaxy 100 million light years away.



Hubble observations have revealed huge waves in the Red Spider Nebula (NGC 6537) a two-lobed planetary nebula in Sagittarius. Stellar winds, driven by a central star of extremely high temperature. The waves have peaks up to 10¹¹km high that "ripple" through space at up to 300km/s. To get the original print, in colour, contact ESA (see this story).

Agency/European Southern Observatory in November 1994, for a stimulating (and extremely well hosted) symposium on Astronomy Education.

The formation of the AAE was a direct result of that meeting, the high point of which for me was the

The ESA are now offering a useful free service to astronomy educators. They will send you regular News and Photo Releases relating to the Hubble Space Telescope.

Before they even get to the newspapers, you can have photo-quality A4 prints of stunning space images from the HST, simply by asking to be put on the mailing list.

Contact: The European Space Agency Information Centre c/o ST/ECF, ESO, Karl-Schwarzschildstrasse 2, D-85748, Garching bei München, Germany.

hubble@stecf.org

Bob Mizon

Please note more changes

Please note the change of editor's e.mail address *again*, shown on the masthead column (right). It is now

gnomon-editor@beeb.net

Sorry the last change didn't work!

Subscription Rates:

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

Members receive four issues of Gnomon a year. Corporate Members will receive three copies of each issue 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.

Web site: www.aae.org.uk

For all enquiries concerning the newsletter, contact the

Editor: Richard Knox,
3 Alexandra Terrace, Penzance
Cornwall, TR18 4NX.

e.mail: gnomon-editor@beeb.net
Telephone/Fax: 01736 362947

Advertising Charges:

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

(inserts may be of any size which may conveniently be inserted in the newsletter. There may also be an additional charge for postage if inserts are heavy.)

A 25% reduction is made for advertising in all four issues.

Publication Dates:

These are at the equinoxes and the solstices, that is four times a year.

Copy deadlines are two months before these dates.

(from page 1. ☞) Without implying any adverse comments on the following list, and certainly not on the students' right to take any subjects they fancy, my own tertiary college adult education brochure for last year included courses as diverse as flower arranging, motor vehicle maintenance, feng shui, garden design, the paranormal, ghosts and spirits of West Cornwall, "psychological astrology - the inner and outer planets" (*sic*), ley lines around your home, and so on, as well as contract bridge, astronomy, languages, art in countless forms, etc.

Virtually all the specialists who offer these courses do so simply for the love of their subject. They are not employed in any normal sense: a handful of hours a week, no pay worthy of the name, and - most important - no guarantee that, after all the preparation they have put into their course, the course will run at all! It depends on attracting an "economic minimum number of students". As this number is increased noticeably each year, it means that the costs of running the courses are increasing steeply each year. What incurs the extra costs? Certainly not what the tutors are paid! The only things I can think of is the number of admin staff needed to handle all the extra forms that we all have to fill out for various irrelevant reasons.

So a vast number of dedicated amateur tutors around

this country will not be qualified any more, in many cases after years of dedicated, successful, and usually, enthusiastic teaching. They are going to be expected to spend precious time attending courses when many have a job to get on with during the day.

What is worse, the "Skills" which the Department of Education now appends so significantly to its name, actually count for nothing. In every other professional qualification (Chartered engineers, medicine, accounting etc.) the skills, responsibility and experience counts for *everything*. Entry qualifications are long since forgotten. (Next time you are going under the surgeon's knife, imagine the nurse making you feel better by telling you how lucky you are: the doctor has just passed his surgeon's exams so he's as up to date as can be!)

The outcome will inevitably be a considerable loss of such specialists available for this work, and of course, a dramatic reduction in the choices that can be offered to students. How does that help education and skills? If AAE members write to the Rt Hon Estelle Morris MP, Secretary of State for Education and Skills, Sanctuary Buildings, Great Smith Street, London, SW1P 3BT and even their own MP, perhaps, just maybe

Richard Knox

Good luck to Sirius-86

Vladimir Golendukhin, one of our members, is President of the "astrocosmic" association Sirius-86 in the Sverdlovsk region of Russia. He has kindly sent a copy of his association's

АСТРОКОСМИЧЕСКАЯ АССОЦИАЦИЯ СИРИУС-86



«Сириусу-86» –15 лет!



Откройте для себя мир Космоса

The A3-sized Sirius - 86 calendar for 2002 marks the association's 15th anniversary. It includes scenes from the previous year's activities as well as a group photograph.

(Below) A lecture on Astronomy Day



calendar for 2002 which commemorates 15 years since the association was founded. He writes that the association combines a number of functions, which include teaching children, from ages 6 to 17, about astronomy and space (the latter meaning "cosmonautics" using the training program devised by Vladimir).

It also provides public lectures and courses on astronomy for the adult population of the region (near Sverdlovsk, now Ekaterinburg). These include the use of large astronomical telescopes. The latest projects include an observatory and an urban planetarium. Anyone who would like to get in touch with Vladimir can e.mail him at:

sirius@online.ural.ru

News from the last ABM

AAE Secretary Jean Collins has had a number of enquires from schools for support material again this year. We are now in need of some updated materials and Jean asked that this be put on the next agenda for the new Committee to discuss. Jean is on the national committee for Women in Science and would like names and contacts for events featuring, or about women scientists in all disciplines so she can promote their achievements.

There were no new applications for the committee other than those tabled. The new Committee was duly elected as follows: President Francisco Diego; Vice Presidents Eva Hans and Sue Flanagan; Treasurer Alan Pickwick; Secretary Jean Collins; Assistant Secretary Teresa Grafton; Committee John Thompson, Ian Crawford (speakers list), Mike Dworetzky (*Query*), Richard Knox (Editor *Gnomon*), Anita Shaw and Paul Dearden.

The new corporate member, Faulkes Telescopes, is a new organisation, working within the University of Leicester to bring the use of the telescopes in Hawaii into the UK classrooms. Paul Roche is the contact person.

Among "any other business" it was stressed that ideas and contributions are needed for *Gnomon* and our web pages. Readers please note.

NZ conference success

In the last *Gnomon* I reported on the Royal Astronomical Society of New Zealand's Annual conference and the following teachers' professional development day. The conference was promoted as "a unique opportunity to meet astronomy educators from NZ, Australia and the USA. You will be inspired, get practical tips, discover new materials and learn new methods". This was achieved!

Arising out of these meetings with the overseas astronomers and teachers is the determination to cooperate more closely in the development and production of resources to help teachers take astronomy lessons more effectively and interactively. Among those taking part were Bob Riddle, a training specialist from the Challenger Center

for Space Science Education; Dr James White, Executive Director of the Astronomy Society of the Pacific; Mike Roach, President of the South Australian Science Teachers Association and Director of Australian Space Schools; and Professor Hendrik Gerritsen, Brown University USA.

The Internet is to be avenue through which contact is to be maintained with access to the vast resources of NASA, ASP and the Challenger Center for Space Science Education. In the first instance John Dunlop of the Auckland Stardome will be the co-ordinator (www.stardome.org.nz) (johnd@stardome.org.nz). Any astronomy educators in the UK who would like to be included "in the loop" please contact either John or me.

Eric Jackson

pipeheng@voyager.co.nz

Free light for visiting aliens

Light pollution has not yet received the full attention that it deserves. The first major book solely on this increasingly high-profile subject, *Light Pollution: Responses and Remedies*, has been written by Bob Mizon (Mizar Planetarium and Coordinator of the British Astronomical Association Campaign for Dark Skies). He describes the growth and causes of the phenomenon, while recommending approaches leading to its alleviation and eventual reduction.

Astronomy educators may find plenty of suggestions for spreading the word that quality lighting and a view of the night sky are not mutually exclusive. There is also a section describing 100 deep-sky objects worth seeking with modest telescopes through moderate skyglow.

The book is scheduled to appear in November, and is published in full colour by Springer-Verlag (London) in their *Practical Astronomy* series. It may be ordered from any bookshop, quoting ISBN 1-85233-497-5.

Bob Mizon.

bob@mizar-astro.freerve.co.uk

Letter to the Editor

A winters tale

I spent quite a chilly evening at my daughter's (rural) home - far from streetlamps - to take photographs, as I thought, of a recent lunar eclipse. I had bought specially a 1600 ASA film and so I set out!

Unfortunately, the said film broke after the second test frame. I did not realise this, of course, so snapped away happily at intervals for the entire duration of the eclipse, to no avail.

I even worked hard to keep the steam from frequent cups of tea away from the lens. Possibly a penance for not sending the article to *Gnomon* in time?

Best wishes, Peter Ford

Indeed so! In fact your interesting piece has now arrived safely, just as I am filling up the last hole in the issue. But I will use it next time. Meanwhile you touched on several important issues in this short anecdote.

- 1. Photo failures are as prone to Spode's Law as the weather (read about my eclipse photo crisis on page 4).*
- 2. Photo failures are in direct proportion to the amount of special effort you put in!*
- 3. See what happens when you don't meet deadlines! Ed.*

OBSERVATIONS

A science teacher at the local sixth form college (or are they all called "universities" these days?) while commenting favourably on the planetarium presentations I had just made at his suggestion during the college open days, told me of his despair in trying to hold some pupils attention for more than 30 minutes. He was concerned about the modern media and the way young people are under a constant bombardment by them. "Everything must go bang every few minutes, or flash in a billion colours, or contain some other fast, furious, or frivolous activity. If not, they become bored." It is not their fault: they are the victims of the ad men, spin doctors, web site designers, and all aspects of the pop culture, all vying for their attention.

When I sit in a modern "planetarium" (the quotes are deliberately implying "so-called") and watch those dreadful Digistar presentations, I yearn for the classic Zeiss projectors and their sedate, but oh so much more realistic and accurate representation of the night sky. I also remember the softly sounding extracts from Vaughan Williams, Delius, Debussy and composers of similar music that allows your thoughts to idly drift among infinite darkened depths. But today, the pace has to be frenetic, the "music" usually not worthy of the name, and the purpose of the show to ensure that the senses cannot be allowed to drift: they must be pummelled!

I have taken my mobile planetarium to many schools, and have always allowed nothing to happen faster than a "satellite" crossing the sky, and have maintained strict control over the music to recapture the environment that I enjoyed when first went to a planetarium. Over the years my

planetarium has been seen by all ages from infants to adults, but it was with some trepidation that I accepted an invitation from a satisfied customer who was now working with handicapped young people at a special school. The audience, who were all seniors doing a project on space at some level or other, according to their abilities, were often severely physically handicapped as well as of varying degrees of mental ability. So the audience was selected for the three morning shows in groups of (roughly) similar (and descending) capability.

I thought of Jean Collins' comment in this section of the last issue, describing teaching about space to people who are blind - especially those who have always been blind, and I must say I found much in common with her observations.

Both my wife (a retired and very experienced teacher, who helps usually on the outside of the dome) and I, found the experience elevating, exhausting, and humbling. It increased my admiration for the staff enormously, and I would not have missed that booking for worlds. Most amazing of all, these unfortunate (is that the right word?) kids were as appreciative as any planetarium presenter could wish for. Indeed, I felt that here were some kindred spirits who reacted to the planetarium - albeit in their own way - equivalent to the way I had reacted when I was their age. They found the sights and sounds in my darkened dome stimulating and exciting. Who needs bangs and whistles? The polar orbiter was about as exciting as it got - and the reaction all round (audience and presenter) was "Wow!"

Richard Knox

Reflections on the century's first total solar eclipse

Living in Cornwall, at a spot which would be on the track of the Moon's shadow during the 1999 total eclipse of the Sun, I realised there was a distinct possibility of bad weather on the Big Day and that would be so frustrating that I needed insurance. So in 1995 I persuaded my wife to join a party of travellers to see the total solar eclipse of that year. She had no real idea about what that might be, but since it was to take place in India, she decided then and there that it was a "good idea"!

Like most people who have not seen a total solar eclipse, I failed to anticipate the addictive effects of this indescribably stunning event. On that day in '95 we both became eclipse groupies. In the process, my wife has become as enthusiastic about matters astronomical as she was indifferent before, realising just how much there is to see and enjoy - if you are in the right place at the right time.

So although it was still extremely disappointing when the '99 Cornish eclipse arrived - and was completely covered in dense black cloud - we were steeled for the worst. But there were many would-be

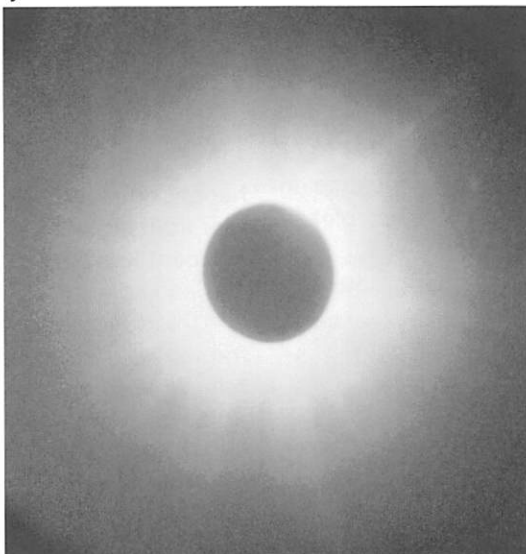
the partially dried-up river bed - easily absorbed the crowd of 450 visitors, and an extremely interested and large number of members of the local population. These were mostly children, who went to the local school whose grounds led down to the river, and their parents - mostly the mums, who took the invasion completely in their stride, continuing to wash their clothes in the river as on any other day until the deepening gloom had caught their entire attention.

These folk were typical of the population of Zimbabwe that we had met all over the country during the week running up to Totality Day. They were infectiously cheerful, friendly and hospitable, totally undeserving the dreadful mismanagement and ruin of their beautiful country. In those surroundings, I could not help being reminded of the hilarious episode in *King Solomon's Mines* as the eclipse got underway. (What a cliff hanger that was! Whenever you are in a tight

spot, you can always threaten your enemies with your godlike control of nature. All you need is a total eclipse of the Sun - that's going to last for over an hour - at the crucial moment and in one bound you will be free!)

The children had the most memorable day they had experienced for a long time, judging by the available resources: eclipse viewing glasses in plenty; uncounted numbers of telescopes; cameras; binoculars projecting images of the shrinking solar disc; pinhole projection effects through fingers and foliage; shadow experiments with string that cause a sharp dark line in one direction that disappears at right angles, as the Sun's width diminishes, and much more. The children could drift from one visitor to the next for a different fascinating demonstration at every stop.

It was hot, too (at the winter solstice!). Quite a few paddled in the river, waste deep in some places. We had arrived at the site with plenty of time, so equipment had been set up at a leisurely pace and stood idle. These keen observers found that they had to put hats on their equipment as well as their heads (in most cases, these were hand towels borrowed from their hotels). It became refreshingly cooler only a few minutes before totality as the



A magnificent, rather symmetrical corona with many spoke-like spikes.

(All photographs by Annette Knox)



Setting up telescopes on the river bank.

eclipse watchers in '99 who still caught something of the amazing atmosphere that surrounds an eclipse - even through the clouds, and the expedition this June to Zimbabwe was swelled enormously by an unprecedented proportion of first-timers. They were not disappointed this time! Ours was one of many eclipse viewing sites from Angola to Zambia, but it was by far the biggest single group, and by far the largest number of locals, visiting astronomers and first-time eclipse seekers gathered together anywhere in Africa on that sunny southern winter solstice.

We had a two-hour bus convoy (very luxurious coaches) north from Harare to the village of Maname on the banks of the river Ruya, not far from the Zambian border and the Zambezi itself. The picturesque river valley - actually part of

(Right) With plenty of time to set up equipment, the next problem while awaiting totality was keeping cool, and people and equipment both needed that! Who is the suave, handsome looking explorer in the white hat?



(Right). The finishing touches to the day of the eclipse were provided by an excellent barbecue. Not bad going for a crowd of 450 visitors plus almost as many locals!

“waning” Sun became a thin bright crescent in the cloudless sky. The eerie, almost monochromatic light of the last few minutes before totality raised the tension

Then the main event had arrived! The usual crop of accidents with equipment began to take place. My own was that, at about 40 seconds to go, I was supposed to remove the home-made partial-phase filter from my video camera. This was a push-fit in the camera’s UV filter holder. A projecting “handle” was glued to the device to allow it to be removed without moving the camera. The handle came away in my hand, leaving the solar filter firmly in place! After the usual panic, I realised all I needed to do was unscrew the whole UV filter holder - it shouldn’t have been left in place during totality anyway because of the risk of spurious reflections!

Totality itself was splendid. The usual excited noises of the eclipse experts was magnified by the amazing noises from the locals. A “diamond ring” to start and finish the total



Local children were well prepared for the hazards of eclipse watching, and helped enormously to understand everything by the invading astronomers.

phase, a huge prominence in a glorious orange chromosphere on the eastern side, and a string of smaller ones round an arc of the Sun’s limb on the other. The corona was as compact as had been expected for a Sun near solar maximum, but the spoke-like array of coronal spikes could not have been much more spectacular.

As usual, the eclipse seemed to end before the second



breath was taken after the initial gasp, so what the next eclipse will seem like (in Australia, in December ’02, which lasts less than 30 seconds) is impossible to imagine. Totality in India in ’95 was just over 45 seconds, which caused gasps of dismay when it was all over, but we were green then and had not been spoiled by over 4 minutes of totality. The most striking novelty as far as this year’s eclipse was concerned was the spontaneous concert of celebration afterwards that was provided by the local people, both young and old. Altogether, it was an unforgettable day. More newly hooked eclipse groupies were born that day in Africa than have been for many a year!

So come on, all those who still think you have seen a pretty good eclipse because you saw the partial phase in ’99, come Down Under in ’02. We’ll see you there, d.v.

Richard Knox



**It’s all over!
The strange daytime twilight returns**

Astronomy lessons from a telephone book.

Ever wished for more hours in a day, or days in a week? Well there are 48 hours in a day and 8 days in a week and I can prove it. Just pick up your telephone book and turn to the International Country codes. Living as we do on the 180th meridian (International Date Line), New Zealanders are aware that each new day starts here and everyone in the world to our west starts their day after us (except for Tongans who have bent the meridian around their kingdom!).

Samoa to our east (and on the other side of the Date Line) is 23 hours behind New Zealand which means that as we start our Sunday, Samoa still has 23 hours of Saturday to go before they start their Sunday. The earth turns once,

and New Zealand completes the 24 hours of Sunday, and Monday starts. But the planet must turn for another 23 hours before Samoa completes their Sunday.

Therefore the Earth must turn twice before every place on it has finished with the same day and must turn 8 times before every place has had all the days of the same week.

Another effect of this is that when travellers fly from here to Los Angeles they cross the Date Line and have two days the same. (Coming back, we would miss a day, of course). Who has ever heard of starting an astronomy lesson with a telephone book?

Eric Jackson

So do New Zealanders always fly westwards? That way they would add many hours on to their lives! Pity poor astronauts flying eastwards faster than the Earth! Ed

The Moon: a biological essay

As long as it has been in orbit around us, the Moon has always had an influence on the Earth. A billion years after the Earth and Moon first began their interplanetary dance round each other, the Earth changed its status. Once a mundane, sterile rock, like the Moon remains, our planet set itself apart from the Moon and planets and became a living world.

Just how the Earth managed to perform this supreme feat of metamorphosis remains an enduring scientific mystery, but not the sheer impossibility that creationists insist. Life on planet Earth probably secured its first tentative foothold around deep-heated fissures on the



The Earth's natural satellite, the Moon, almost opposite the Sun in the night sky, shows its face almost fully illuminated. Cover up the left-hand half to see the Poodle (or the Rabbit, or whatever) as noted by many different cultures. (Drawing by the author)

ocean floor - primitive organisms that were sustained on a diet of ultra-hot water rich in elements and minerals.

Just 380,000km away, looking down on its sister planet's dramatic transformation, the Moon remained arid and sterile, for without an appreciable atmosphere or liquid water, the Moon was incapable of nurturing even the lowliest forms of life. Some three and a half thousand million years ago, the Moon was considerably closer to the Earth and it would have appeared as a massive globe in the skies. The sea tides caused by the Moon's gravity were much stronger than they are today, and this phenomenon is believed to have been entirely beneficial to life's development. An Earth without a satellite to tug at its oceans and stir the ocean deeps may not have evolved the amazingly varied biosphere we enjoy today.

Orbiting the Earth as regular as clockwork, the Moon's tidal rhythm imprinted itself within life's cycles. Many organisms living today - both marine and terrestrial - still display startling genetically-coded evidence of their ancient lunar heritage. For example, if transplanted from its native shallow sea environment to an aquarium, the tiny flatworm *Convoluta* will emerge from the sand at the bottom to bask in the available light and then withdraw once more into its burrow. Even though *Convoluta* does not have a highly developed brain (and each little green creature has certainly not independently learned such behaviour) it performs this routine twice a day - an ancient, genetically programmed response to the twice-daily sea tides which it has naturally endured for hundreds of millions of years.

Such responses are evident in many species whose natural life depends on the rhythm of the tides caused by the Moon.

Perhaps the most famous (certainly the most

6 spectacular) of all Moon-related behaviours is performed

by the grunion (*Leuresthes tenuis*) of southern and Baja California coasts. From March to August each year the fish breed on the four nights after the highest tide of the full (and new) Moon. With their silvery flanks reflecting the light of the waning gibbous Moon, thousands of the fish surf the waves of the ebbing tide to emerge from the water. In the space of under half a minute before the next wave comes in to carry them back to the sea, the females lay their eggs (2,000 of them) in holes five centimetres deep, and the males fertilise the eggs. Two weeks later, at the time of the next high tide, the larvae have matured and the young grunions hatch from the eggs to be washed out to sea. The species began to perform this remarkable ritual millions of years before human life evolved.

The mayfly which lives its brief adult life around Lake Victoria in Africa, emerges as an adult only on the nights around full Moon to complete its life cycle - to find a mate, lay its eggs in water and then to die. Vast swarms of the mayfly float like nebulae shimmering in the tropical moonlight. Having evolved big compound moonlight-sensitive eyes, the Mayfly is one of the most ancient groups of insect and is the oldest winged insect; they have been identified in fossil form within rocks dating from 300 million years ago.

Around two and a half million years ago, the keen eyes of the earliest humans must have observed the huge clouds of Lake Victoria mayfly shimmering like mirages in the moonlight. At this time, the brains of our ape-like ancestors were beginning to develop rapidly. At Olduvai Gorge in the Serengeti Plains bordering Lake Victoria, evidence has been found for early human evolution and construction of simple tools. Our ancestors were probably thankful that the Moon provided a dependable light in the night sky, illumining what would otherwise be a pitch darkness relieved only by the stars and occasional meteor flashes.

Planned hunting and gathering activities, the use of fire, clothing and elaborate funerals appeared less than 350,000 years ago, and it was at this stage in human history that the Moon probably assumed a significance greater than being



Two photographs of the Moon, in both cases close to the quarter. (Left) The waxing Moon (see the Poodle?) and (right) the eastern hemisphere of the Moon seen during the waning period just before the last quarter.

just a convenient nocturnal lantern. The Moon took on an air of mystery - a distant untouchable object whose nature was beyond comprehension. The first true human beings looked at the Moon and registered its small bright globe with keen neurones within an ever-growing cranial capacity. The Moon was evidently lit by a special kind of fire, for the flames which illuminated it were cold and did not flicker. Our satellite was established as an object of great religious and mystical significance.

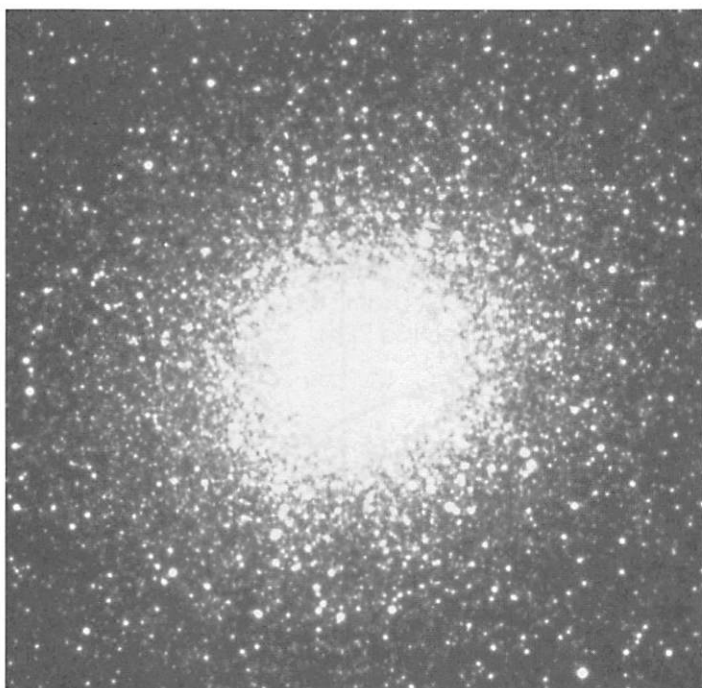
Peter Grego

Editor, *Popular Astronomy*
Director, SPA Lunar Section

News from Down Under

Ground-based astronomy is undergoing a revolution, particularly from a United Kingdom point of view. The main funding body for UK astronomy, the Particle Physics and Astronomy Research Council (PPARC), has almost concluded negotiations with the European Southern Observatory (ESO) that will allow UK astronomers open access to the ESO telescopes in Chile, particularly the four 8m giants that make up the Very Large Telescope (VLT).

At the same time, PPARC has announced plans to scale back its involvement in the Anglo-Australian Observatory from 2006 onwards. Here at the AAO, we are already taking steps towards reducing the costs of operating the 4m-telescope, such as scheduling longer observing runs and reducing instrument changes. However, PPARC does



The Great Globular Cluster in Hercules (M13) as seen from the Digitised Sky Survey Web site (see text)

intend to retain its investment in the instrumentation development and construction division of the AAO, which has contracts to build new instruments for the VLT and the Japanese Subaru 8m-telescope, amongst others.

Oddly enough, the next big revolution in astronomy may not involve building any new telescopes or instruments whatsoever; rather, it will come from a homogenisation and merger of the various observatory archives and on-line

databases into a so-called "Virtual Observatory". Since the introduction of the World Wide Web in the early 1990s, a large number of data servers have been set up to enable ready (and usually free) access to electronic data.

Amongst my favourites are the NASA Extragalactic Database <http://nedwww.ipac.caltech.edu/> (data on external galaxies); Simbad <http://simbad.u-strasbg.fr/Simbad> (for stellar data); the Astrophysics Data Service <http://adsabs.harvard.edu/> (for literature searches); the Digitised Sky Survey http://archive.stsci.edu/cgi-bin/dss_form (for optical images of any part of the sky); and the Multimission Archive at Space Telescope <http://archive.stsci.edu/> (for data from various satellite observatories).

The recent public release of data from the Sloan Digital Sky Survey <http://www.sdss.org/>, 2 Micron All-Sky Survey <http://www.ipac.caltech.edu/2mass/overview/access.html>, and 2dF Redshift Surveys <http://www.mso.anu.edu.au/2dFGRS/> and <http://www.2dfquasar.org/> adds mind-boggling amounts of data to that already available.

Until quite recently, little thought was given to how to link these databases together. One of the main goals for a Virtual Observatory is to act as a "one-stop shop" for an astronomer who wishes to find out everything that's known about any particular object in the sky. Another powerful feature will be the ability to do "data mining", such as to compare multiple catalogues and extract only objects which are common to two or more.

For example, one might want to compile a list of all quasars which have a radio flux greater than 1 Jansky at a wavelength of 20cm, an optical-to-infrared "colour" redder than 3 magnitudes, a redshift between 2.0 and 2.5, and an X-ray luminosity of more than 10^{44} erg/s (exactly why one might want that I'm not sure!). Currently this would entail searching separately each of a half-dozen or so catalogs, then attempting to cross-match objects between them, allowing for differing positional uncertainties (and probably different epochs as well!). The hope is that a Virtual Observatory will make this transparent and painless.

Even though little extra hardware is involved, such a new facility will not come cheap. PPARC is investing a total of £26m over the next three years just into developing the tools and infrastructure necessary for "e-science".

A consortium of universities are collaborating on the "Astrogrid" <http://www.astrogrid.ac.uk/>, which will form the UK contribution to an international Virtual Observatory. While some may mourn the reduction in travel opportunities that "observing" at a virtual observatory entails, others will revel in the knowledge that a virtual observatory is never cloudy!

Stuart Ryder
sdr@aoepp.ao.gov.au

Sky Diary Autumn 2001

The second 2001 Equinox, Autumn in the northern hemisphere, is now over a week in the past and the evenings are dark enough for astronomers who don't like being up at night. The sidereal clock is noticeably gaining on the solar mean time clock and constellations that have been swamped by twilight most of the night during the summer are now moving into a dark evening sky as a result. The Scorpion is a good example of this phenomenon. At its midnight culmination at the end of May it is often not very prominent in the all-night astronomical twilight suffered at British latitudes.

In the evening sky in Zimbabwe in mid-June, where a good many amateur astronomers had gathered for the total solar eclipse (see page 4) it was mid winter, and as every day of the year, the Sun had set around 6 pm - of course a bit earlier in mid June than in mid December. The Scorpion made a fine sight high overhead with Mars alongside and proved that Antares (which means "Rival of Mars") is no match for the Red Planet when it is close to one of its near-perihelic oppositions. So from south of the equator Scorpius is obviously a late Spring constellation. From Britain, as the twilight rapidly shortens and fades as July goes by, in early August Scorpius becomes quite easy to see in the early evening sky.

Rising and setting times (UT): lat. 52°N; long. 3°W

	October 15		November 15		December 15	
	Rise	Set	Rise	Set	Rise	Set
Sun	06h 36m	17h 17m	07h 31m	16h 20m	08h 13m	16h 00m
Mercury	06h 27m	17h 03m	06h 24m	16h 01m	08h 55m	16h 09m
Venus	04h 26m	16h 48m	06h 05m	15h 54m	07h 39m	15h 32m
Mars	14h 26m	21h 56m	13h 15m	22h 00m	11h 55m	22h 11m
Jupiter	21h 27m	13h 53m	19h 30m	11h 56m	17h 15m	09h 46m
Saturn	19h 28m	11h 30m	17h 24m	09h 23m	15h 14m	07h 09m
Uranus	15h 26m	00h 54m	13h 25m	22h 49m	11h 28m	20h 55m
Neptune	14h 46m	23h 29m	12h 45m	21h 28m	10h 49m	19h 34m

Similarly, after the equinox, the Summer Triangle and its part of the sky with the magnificent small and faint constellations like Sagitta and Delphinus are much better seen, even though they are well past their midnight culmination in mid-July. Even in mid-October, as shown in the chart on page 8, the Summer Triangle is easy to observe in the early evening. In the chart, Altair has set, but the Swan (Cygnus) is diving head first vertically towards the horizon around west norwest, and Lyra is still above the horizon.

But undoubtedly the most obvious change in the celestial evening aspect at this time of the year, due to the advance of the stellar sphere compared with the Sun's one degree per day easting progress, is the reappearance of the magnificent winter sky constellations. This year they are joined by Jupiter, in Gemini, and Saturn, still in Taurus, which we had been watching for so long last year as Jupiter gradually caught up its magnificently ringed neighbour. Now we see Orion, Gemini, Auriga, Taurus, Canis Minor, and Canis Major (although Sirius is still rather low at the time shown in the chart).

In the northern circumpolar area, Cassiopeia is prominent and not far from overhead, and Ursa Major is plodding down over the northern horizon. The Great Square of Pegasus, with Andromeda eternally chained to her rock awaiting Perseus to come to the rescue dominate the south west.

Saturn is already moving in the retrograde direction by the time of the chart. It will pass close to the Hyades and Aldebaran in late December, passing back again in March next year. On September 12, Jupiter is occulted by the Moon, but unfortunately during the afternoon daylight hours.

On the morning of the day after the chart, October 16, is one of the precious opportunities to see the Moon as its thinnest crescent phase. In this case, look for the Moon at 6:00h (UT) at an altitude of only about 2° almost due east (actually 5½° to the

south of east). The Moon's western elongation is only 8° so it will need a very clear, true horizon. Venus makes a 45° angle with the east point of the horizon being at an altitude of close to 14° and an azimuth of the same amount south of east. This all takes place 13½ hours before New Moon. At the end of October, and in early November, Venus and Mercury will be in the eastern dawn with Jupiter and Saturn still in the sky, Jupiter still about 60° high.

On November 3d 21h 04m UT, Saturn will be occulted by the Moon (three days after Full Moon). This happens again on December 1d 2h 25m, very close to Full Moon. Get your cameras and telescopes out!

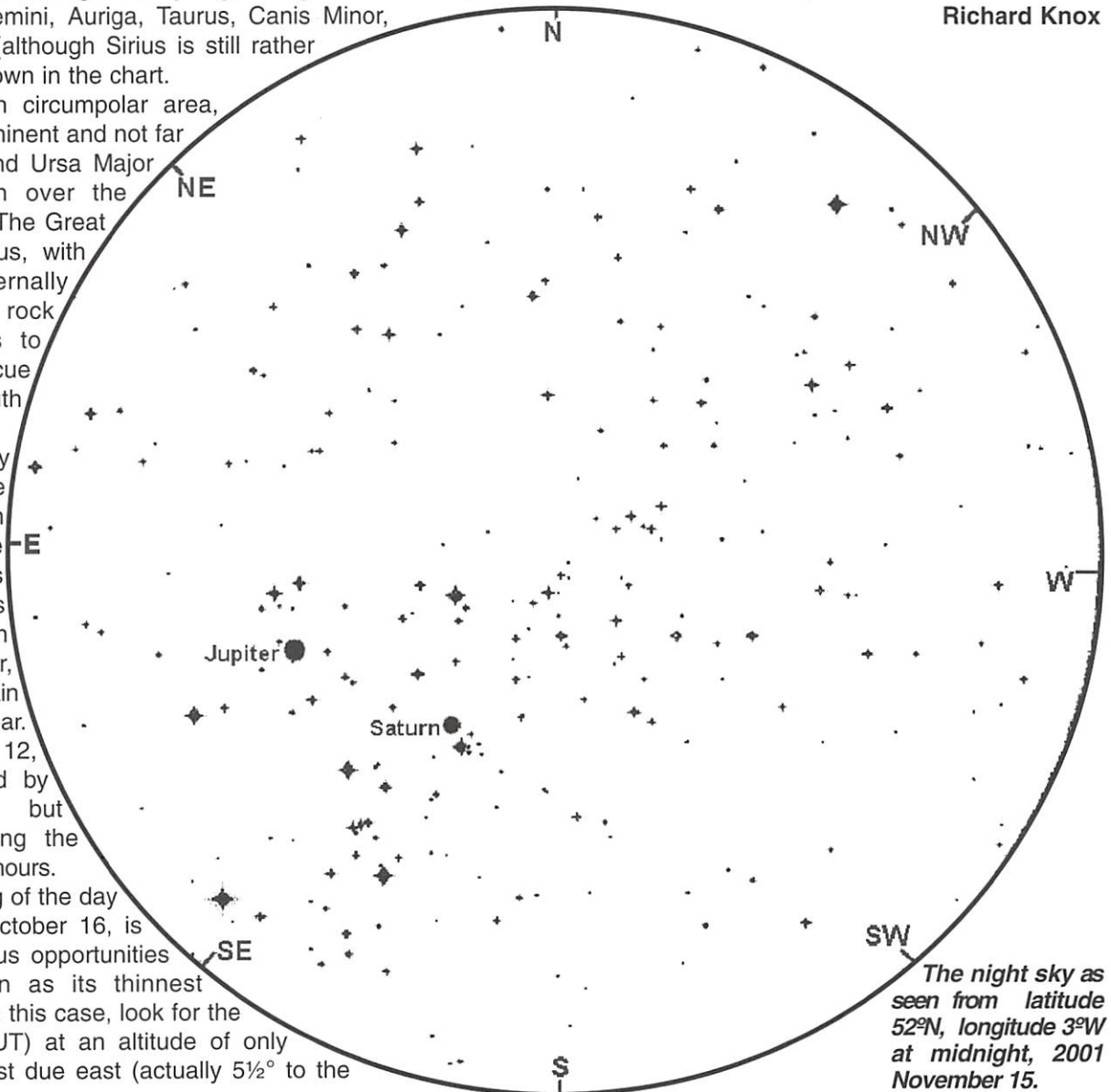
The Leonid meteor shower this autumn is unlikely to be the best it could be, but will probably be the best we can

Moon phases for the last quarter of 2001

Month	New Moon	First Quarter	Full Moon	Last Quarter
October	16	24	1	10
November	15	22	1/30	8
December	14	22	30	7

expect now for some 30 years to come as the Earth's orbit and the remnants of the tail of comet Tempel-Tuttle move apart. Good luck to those travelling to the Pacific to try for the best view. The Leonids are around from November 15 to 20, with the maximum predicted at 17d 14h. Also watch out for a good show from the Geminids (maximum predicted at December 13d 22h).

Richard Knox



The night sky as seen from latitude 52°N, longitude 3°W at midnight, 2001 November 15.