



Gnomon

Newsletter of the Association of Astronomy Education

Vol. 24 No. 4

ISSN 0952 326X

SUMMER 2005

Challenging times ahead for our Association

Efforts to stop the decline in the membership of the Association of Astronomy Education have not yet succeeded, warned Francisco Diego, President of the AAE, speaking at the last Committee Meeting. "Clearly it is time to stop and reflect" he said.

These were challenging times for the Association, he went on. In recent years we had seen our activities increasing and diversifying. Our website now offered free services such as the Speakers' List and Query Line. It also showed a catalogue of educational resources and useful links for teachers to follow. Our Annual General Meetings had been well attended, now in conjunction with the British Association of Planetariums. The event typically covered an entire weekend full of interesting activities.

Our presence at the ASE Annual Meetings had expanded, he continued. With a lot of enthusiastic effort from our members, we had offered lectures, workshops, entire astronomy days and a well-presented stand. The AAE had been represented in several TV news broadcasts in relation to recent solar activity and planetary missions.

"But perhaps the time to come for fresh ideas, and enhanced links to other groups with similar goals to ours", he said. The challenge was to use the unique opportunity brought about by the spectacular discoveries in the Universe, ranging from distant and ancient galaxies and the very first stars ever, to the robotic exploration of the solar system. It would not be long now until we had conclusive

evidence of primitive life beyond the Earth, he predicted. It would not be long before we knew about extra-solar planets similar to the Earth. Astrophysics, cosmology and astrobiology had overtaken astronomy. Our task was to find ways to bring this new and rich cultural heritage to the classroom and to the general public.

"As a first step we have invited Anita Heward to this meeting to give us a broad picture of the new structure of the education committee at the Royal Astronomical Society where she is trying to produce an ambitious database of educational groups and resources, initially at school level. I am sure that we will find plenty of scope for a close collaboration", he said.

"There are more invitations to come. I would like to ask all our members to consider this critical situation and to make a special effort to come with ideas and help in facing this challenge", he concluded.

Anita Heward works for the RAS one day per week and for PPARC for one or two days per week. She organises the "Festival of Science" every year for trades, schools and other bodies promoting astronomy and space. She also sits on the Space Education Council which brings many organisations together e.g. BNSC, Kinetic, PPARC, Catalyst, Orbital Mechanics and some University Departments. The Space Education Council faces similar issues to the AAE, she explained.

The RAS Education has been split into two, the "Higher Education Committee" and the "Education and Outreach Committee". Strategy issues were to be discussed at the next meeting. The Department of Education and Skills has just joined the BNSC partnership, opening up some potential for consultation links.

Anita has assembled a database of 125 organisations providing resources in space and astronomy to schools. She said that she hoped to develop this as a web site. The

Diving into the fastastic Whirlpool

During the 15 years that the NASA/ESA Hubble Space Telescope has orbited the Earth, it has taken three-quarters of a million photos of the cosmos - images that have awed, astounded and even confounded astronomers and

the public alike. NASA and ESA have released new views of two of the most well-known images Hubble has ever taken: the Eagle Nebula, and spiral galaxy M51, known as the Whirlpool. The results are among the largest and sharpest views Hubble has ever taken. The newer ACS camera produced a new Whirlpool Galaxy (M51) image that showcases the spiral galaxy's classic features, from its curving arms, where newborn stars reside, to its yellowish central core that serves as home for older stars. NASA's Space Shuttle Discovery launched Hubble into space on 24 April 1990 and placed it into orbit a day after, opening a brand new era in astronomy. Scientists using Hubble have compiled a long list of scientific achievements since its launch 15 years ago which are reviewed and extensively illustrated in a new free DVD available from ESA (see page 6)

(Photo: ESA)



☞ draft database will be circulated by e-mail to Council members for comment. Anita then pointed out that organisations need to be more aware of the programmes and resources of others, to avoid duplication of effort. People need to talk more and share resource and marketing campaigns, she said.

Letters to the Editor

GCSE astronomy in *Gnomon*

As mentioned in my article in the last *Gnomon*, the popularity of GCSE Astronomy continues to grow and it remains our only pre-degree astronomical qualification. With this in mind, might it not be a good idea to have a "GCSE Astronomy Corner" in future issues of *Gnomon*? Edexcel have some excellent resources to support students and teachers working on the qualification for the near future, which we could give details of in this regular feature. It would also allow the increasing number of teachers delivering this course to share ideas and comments etc. What do readers think? Best wishes,

Julien King

Principal Moderator - GCSE Astronomy

Thank you for that excellent suggestion and generous offer Julien. All teachers working on this qualification ought to be members of the AAE, and such a column would be of great help. Perhaps other readers who could contribute might also respond to the proposal, through Gnomon: the only problem I foresee is ensuring a regular input to this column, but let's see what we can do. Ed.

Eric Zucker

I was saddened to learn of Eric Zucker's death via his obituary in the Spring 2005 AAE Newsletter. He was an enthusiastic teacher and great supporter of the AAE. I don't really wish to comment on issues within a sensitive presentation such as an obituary, but there are a couple of points related to the interests of historical accuracy.

The AAE was actually founded in 1981 (not 1980). Its birth was triggered by discussions that took place at a workshop on Astronomy education in January 1981 at the then Hatfield Polytechnic. The inaugural meeting was held on 1981 May 16 in Liverpool.

The impression of the obituary might suggest that Eric was the first editor of the AAE Newsletter. This is not the case, but he turned out to be its saviour at a critical phase. At the Liverpool Meeting, I offered to act as Editor and Producer of the AAE Newsletter.

I don't have the first edition to hand, but I believe it was distributed in September 1981; the second edition was certainly January 1982. The early versions were in the form of an A5 booklet with a cover using a simple logo of a genie lamp, with a star emerging from the smoke.

Mrs Margaret Morris was key in helping me with its production and circulation: all the costs and postage were subsumed by the University Observatory in Glasgow. Eventually, the role of Editor was taken up for the 7th edition (Vol. 3: No.1) by Colin Goodman, a teacher in Hinckley.


The current AAE logo was added (where it came from, I do not know) for Vol. 3: No.2, January 1984. - the genie lamp was removed and has not been seen since.

In the Spring of 1986, Colin was taken ill with an appendicitis while Vol. 5: No:3 was being prepared. It was at this stage that Eric stepped in to save the situation. Later, in 1987 (Vol. 7: No.1) Eric produced the new and current format, with the title of *Gnomon*. Being the kind of organisation that the AAE is, I know that it is impossible to keep an archive. I hope this is therefore of interest.

With best wishes

David Clarke.

Dept. of Physics & Astronomy, The University, Glasgow

 d.clarke@astro.gla.ac.uk

Thank you for helping to put the record straight, David. See also the article on pages 4 and 5. Does anyone have early copies of Gnomon? If so, I would be interested in trying to build up a complete archive in some way, but my set has nothing earlier than Vol. 9, and several missing between Vol. 9 and 17. Please drop me a line if you can help. Ed.

Nautical naughtiness

I have been an inactive* member of AAE for quite a few years, but I look at *Gnomon* with interest and I pass my copy on to the library of the Norman Lockyer Observatory Society in the hope that someone else will also read it.

I have been stirred to action by your erroneous description of nautical twilight on the back page of the Spring issue. If possible you should try to find a copy of the Explanatory Supplement to the Astronomical Ephemeris. The period of nautical twilight (when the Sun's zenith distance is between 96 and 102°) is such that the navigational stars and the sea horizon can both be seen and astro-sights can be made to determine the position of the ship. During civil twilight only the brightest planets and stars can be seen while during astronomical twilight the horizon cannot be seen clearly.

With best wishes,

George A. Wilkins

(former Superintendent of the Nautical Almanac)

* I have since remembered that I gave a talk about the NLO at the joint meeting of the AAE and BAP at Chichester last year.

That'll teach me to make flippant remarks about sailors bumping into things! My copy of the Supplement uses my description, but goes on to say nautical twilight is when you can see both the brightest stars and the horizon, for navigational purposes. Ed.

Subscription Rates:


Individual Members £12.00
Retired Members £10.00
Corporate Members
(e.g. schools, colleges etc.) . . . £24.00
Members receive four issues of *Gnomon* a year. Corporate Members will receive three copies of each issue.

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, effectively reducing their contributions.

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

Association for Astronomy Education,
The Royal Astronomical Society,
Burlington House, Piccadilly,
LONDON W1J 0BQ.
 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: 01736 362947

Any photographs sent to the Editor by e-mail (preferred) should be sent in a common format (TIF or JPEG) with resolution not less than 300dpi
© Material from *Gnomon* may be used by members in scholastic applications. Publication elsewhere must have the written permission of the AAE or the authors.

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. Heavy items may incur an additional charge for postage.)
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 six weeks before these dates.

Popularising astronomy in Brazil

The first five years of the Morro Azul Observatory

A five-year programme aimed at maintaining sustained activities in education and popularisation of astronomy at the Morro Azul observatory in Brazil has been successfully accomplished. The foundations of these activities include visits to the observatory, articles in the media, projects with students and teachers, courses, studies and research projects.



Demonstrations in hand for students at the Morro Azul observatory. The run-off roof of the observatory (foreground) has been opened to show a telescope.

In 1999, the Instituto Superior de Ciências Aplicadas (ISCA Faculdades), from Limeira, SP, Brazil, began a project to analyse the demand from students and schools who chose Morro Azul for these purposes. It is the highest point in the region with an altitude of 840m and 5km from the urban area. After hiring teachers and a technician, a study was carried out to decide where to install the buildings.

By March 17th 2000 we had built a classroom, where one can attend a general introductory astronomy lecture, and see a display of photos. The observatory has a Newtonian 150mm telescope with a motorised German equatorial mount, and a heliostat that projects the Sun's image into the observatory (front left in the photo above).

In August of 2000, visits from the general public and the schools began at the observatory. A lookout on the roof of the classroom where one can see a view of the region, horizontal, vertical and equatorial sundials; a playground and four kiosks were already in place. In 2002 an 8in-Schmidt Cassegrain (C-8) was added. Priority was given to buildings and instruments of small size and low cost to accommodate the introduction of astronomy to the public, with an eye to informal and non-scholastic teaching in natural setting outside the classroom.

To make the observatory more well-known, it was promoted through the media and in schools. A course called "Introduction of Astronomy" was offered to the public and pro-



Lectures in progress at the observatory

noted on the Internet through the observatory's web page

www.iscafaculdades.com.br/observatorio.

Visits and meetings were held at the observatory by authorities, teachers and education leaders of the region. Folders and posters were distributed in the city and schools of the region, aimed at increasing the presence of the observatory in the local teaching system. Schools visits were scheduled and it was found that interest depends greatly on the presence of the observatory in the media during astronomical events. As of end of the 2004, the observatory had hosted about 9400 visitors.

Approximately 760 children from a social project, with their teachers, built sundials in Care Centers. Other collaborations led to the development and application of models of eclipses and astronomy bingos, through the use of instruction materials.

Two astronomy disciplines, and practical classes, were established for the geography course. Also other activities were developed for other courses aimed at training teachers.

Four courses were offered to the general public and to teachers; two exhibitions of astronomy photos and activities such as "Vacations in the observatory" relating to the calendar, and the construction of sundials from kits.

The observatory has always been highly visible in the community during high profile events such as eclipses and the opposition of Mars in 2003, with lectures, observations of the sky, and articles in the regional press. The observatory has published 42 articles and 95 reports in newspapers, and been involved in 31 television and 15 radios shows. It was represented at 15 astronomy meetings, and published 21 papers in the astronomy education area. It also became the headquarters of the Teaching Section of the Ibero-american League of Astronomy (LIADA) (www.iscafaculdades.com.br/liada) and it publishes the Latin-American Journal of Astronomy Education (RELEA)

(www.iscafaculdades.com.br/relea).

The activities and visits mentioned above, the teaching section of LIADA and its publication RELEA strengthen their institutional presence in national and international projects, and foster exchange with other astronomy centres, with potential future contributions to research in science education.

Paulo Sergio Bretones (IG/UNICAMP and ISCA, BRASIL)

bretones@mpc.com.br

Vladimir Cardoso de Oliveira (ISCA, BRASIL)

vladcol@vivax.com.br

Free teacher training for the Faulkes Telescopes

The Faulkes Telescope Project has arranged a series of teacher training events for potential users of the telescopes. The following dates and venues are planned for the dates after this issue of Gnomon is published:

08 June : CPR Learning Space (Camborne, Cornwall)

07 September: Jodrell Bank (Macclesfield, Cheshire)

All events run from 10am to 4pm and are available at no charge thanks to support from the Dill Faulkes Educational Trust, Particle Physics and Astronomy Research Council and the Department for Education and Skills.

Teachers attending will also receive a free trial Faulkes Telescope subscription so they can try out the telescope for themselves. Free posters and astronomical resources will also be available for teachers to take away and use.

The aim of this one-day training course is to demonstrate the relevance of the Faulkes (Cont. on page 5) **3**

A brief biography bearing on the birth of the AAE

On the 22nd November 1936 I joined the Union Castle *Sandown Castle* in the London Docks as the only cadet. The ship proceeded to Calais and thence to the USA East Coast where we loaded general cargo, including case oil for South African coastal ports as far as Beira. My brief pre-sea training had been two months at the Southampton School of Navigation at South Hill in Southampton. There were only two cadets and half a dozen second mates so that the programme was completely *ad hoc*.

In South Africa, our master was invalided home and Captain Lecky took over for the voyage on the South African coast. He then was then relieved by Captain Smaile who, continued in command for the next ten months of the voyage until we returned to the UK.

We sailed from Cape Town and after a few days he sent for me and asked if I had a sextant. On my replying "Yes", he told me to join him on the bridge when he would be taking the evening's star sights for position. This I did and had to tell him the altitude of the stars, which we both shot. At the end of this exercise, he told me to calculate the ship's position. I had no idea at all how to start! He asked me if I had a copy of *Nichol's Concise Guide* - a very comprehensive, up-to-date self-instruction manual and on my replying in the affirmative, he said "Well, follow that through and bring me the position. It doesn't matter what time you finish the job: any time will do during the night but let me have the position you calculate."

With considerable labour and worry, I finally got a position at about 11:00 p.m. I very hesitantly knocked on the "old man's" door and presented him with the calculations. They coincided quite well with his own.

As a result of this, I had to take star sights every night and produce the position for him. It was extremely difficult for me to follow the reasons for the calculations, al-



Sandown Castle was built in 1921 by Short Bros. in Sunderland with a tonnage of 7607grt. She was built as a cargo only ship and operated between the USA and South Africa, occasionally sailing to the UK. She was scrapped in 1950. (Photo: A Duncan)

though the mechanics of the operation quickly became easy to follow.

The Second Mate, a very tough ex-South African cadet, told me that when we got to New York I should go to the Hayden Planetarium and follow their programme through. This planetarium was, I believe, the only major installation of its kind in the world at that time.

The programme was superb and built up the full picture in the sky of the spherical triangle, which is the basis for all navigation calculations. It was an absolute revelation,

and from that time onwards I had no real problems. It also impressed me with the value for such an instrument in introducing youngsters to some appreciation of the stars and the scale of the universe. There is little doubt that an exposure to the stars at night during a long voyage, and



A scale model of each of the planets hangs beside the dome representing part of the Sun's orb in the Hayden Planetarium, New York. (Photo: Terry Ballard)

equally, to the minute plankton and other sea inhabitants found when taking soundings for example, were incredibly impressive. These began my understanding of the powers of nature, of our own insignificance and of our part played in the universe. Few seamen have other than deeply held feelings on these matters, even if by no means apparent.

After my sea-going career, I qualified as Extra Master and took up a teaching position at nautical colleges in London and Liverpool. From this - and very much to my surprise - I was selected as an HMI with special responsibilities in sea and air training. I was posted to the North East, based on Newcastle where I became the General Inspector and District Inspector for eight districts in the North and the Specialist Inspector in North Wales and Northern England.

My responsibilities included the South Shields Marine and Technical College. This was the largest marine training centre in the country with a wide range of work in navigation, engineering, fisheries and specialised short courses in radar and other subjects. The College had originally started as a private school in the South Shields but the owner ran out of money and the College was taken over by the Marine and Technical College. It had a first class Principal and an excellent Head of Department. Some years earlier they had been given an observatory, which was occasionally used. Captain Earl, the Head of Department, was anxious to compliment this with a Teaching Planetarium. Needless to say, I strongly supported this - not only for its value to the professional courses but also to provide a focal point for groups from schools in the North East to have an introduction to the sky - something rarely seen in fact with city lights.

By a happy coincidence, the Northern Advisory Council for Further Education had no marine sub-committee. This was quickly rectified after discussion with the Secretary and my staff Inspector colleague who acted as Assessor to the Council. The Northern Committee immediately set

about producing publicity material for careers, a sailing sub-committee which developed valuable testing programmes for teachers and short courses, the encouragement of mid-apprenticeship release programmes, encouragement of extended courses in a number of selected schools with a bias towards marine activities and an astronomy committee.

The committee included representatives from the Durham Schools' Examining Board and a number of others interested in astronomy in the north-east – including, of course, the Marine College. It was strongly supported by the Mayor of Carlisle, also a keen astronomer. It thus became possible for the Committee to recommend to the Main Nautical Committee, thence to the Advisory Council, that the South Shields Authority might be invited to provide the planetarium to provide a service to the region as a whole. With this backing and invitation, South Shields accepted and the first teaching planetarium in one of our colleges was provided. It continues successfully.

Running beside this, a sub-committee was set up to consider the possibility of introducing a GCE course in astronomy. Durham University was thoroughly supportive. It was the first time, I believe, that a course of this kind which had a considerable bias to practical work and projects had ever been put forward and the first time that a GCE in Astronomy had been launched. This too progressed, although in due course when Durham University gave up their examining at this level, another board took it over.

It was clear that co-operation between the limited number of schools interested in astronomy could be of considerable value and they would also gain support from the provision of planetaria.

My science colleague, Clive Williams and I, therefore, decided to put on a short course for teachers in astronomy. We invited South Shields Marine and Tech to co-operate with us. This they did. Some forty teachers attended, and the course could be considered reasonably satisfactory, although, sadly, it did not lead to a follow-up. I had very much in mind the precedent from a navigation sector where the Association of Navigation Schools made a valuable contribution to the thinking on that subject and to supporting the work of HMI.

I took on further commitments and moved to the London area. As so often happens, I discovered by accident that Donald Gold, a colleague on the Management Panel, was spending a holiday at Cape Canaveral and he was in fact a keen astronomer. Another colleague, Morris, was operating in the schools sector and was equally keen. Almost as a hobby, Gold and Morris proceeded to carry out a survey of the astronomy work taking place. This extended approximately from 1965 to 1967. A valuable report was produced, although Morris's sudden and tragic death curtailed the operation to some extent.

Donald Gold had established good relations with the Royal Astronomical Society and the British Astronomical Association and this led on to a meeting at the RAS, chaired by Dr. Macnally and including the BAA, a number of representatives from planetaria and others with a keen interest in the field. It rapidly became quite obvious that co-ordination was eminently desirable. This was generally agreed and the two Societies agreed to look further into it on a mutual basis.

The objective in my own mind was to see a Planetarium established in each city of 250,000 population and there was obvious value and leverage in starting with those cities which had nautical colleges and could provide some specialist approaches. Plymouth rapidly responded and planetaria were subsequently provided at Hull and in London, but shortly after this an economic cutback hit the whole scheme badly.

In 1971 Donald Gold and I were part of a group visiting business schools and universities on the West Coast of America. In the course of it, we were able to spend a few hours at the planetarium of the University of Southern California. It was highly impressive.

From my point of view, commitments made it very difficult indeed to give much time to this field and one of our strongest supporters, Clive Williams, unfortunately was approaching retirement. He had made considerable contributions. I felt that if I retired as I was due to in 1981 without doing something further in this field, I should always regret it and feel something was uncompleted. So we invited the Hatfield Polytechnic, which had a keen astronomy interest in the Hertfordshire area, to operate and administer a short course for us at the beginning of 1981. This attracted very good support, not least from various planetaria and was a most successful programme. The work of Hatfield was much appreciated. The follow-up was much more satisfactory than the earlier effort and led to the creation of the Association of Astronomy Education in May 1981.

Donald Gold, who had done so much in real terms to promote this, became its first President - a well-deserved honour. I have to confess to a feeling of joy that the outcome had taken us quite a long way forward for the AAE was itself a recommendation from the last course for a co-ordinating body of some kind to provide a central focus and guidance for teaching material.

These notes bear on Tony Lacey's comments in the Winter 2002 Edition of *Gnomon*. I have to say that in dictating them, I have been very much scraping the barrel of memory. For many of my papers have disappeared since my retirement some 24 years ago! I still enjoy reading *Gnomon* and to see the progress constantly being made. I think there could have been some disasters without its presence.

Peter Dudley

☞ (cont. from page 3) Telescopes to a number of curriculum areas within science, and related subjects. The course is very much "hands-on" and you will have the chance to try out skills you can then take back and use with students. The course will cover the following topics and skills in various ways and is relevant to KS3, KS4 and post-16 (KS5. KS2 teachers and non-teachers may also be interested in the course and should contact us for more details). A certificate of attendance will be issued for your personal and department development portfolios.

● Waves, optics, refraction, reflection, electromagnetic spectrum

- colour imaging, human eye, making colour images
- photons, electrons, CCDs
- finding asteroids & comets, Solar System bodies
- mathematics, so-ordinate systems
- robotics, sensors, weather, ICT systems
- The scientific process

Places will be limited to around 15 teachers per course to ensure that enough one-to-one training is available during each day. To book a place on one of the above courses contact:

✉ david.bowdley@faulkes-telescope.com

or call ☎ 01902 493892

For your (video) library

Hubble: 15 years of discovery. Directed by Lars Lindberg Christensen. Presented by Bob Fosbury. Time (main feature) 83 min. plus menu of extras, and choice of English, German or Greek, with subtitles in 15 other languages. Available from ESA.

Claimed to rate as one of the most widely distributed documentary films ever made, this DVD has been launched as part of a number of educational products produced by the European Space Agency to mark the 15th anniversary of the launch of the Hubble Space Telescope.

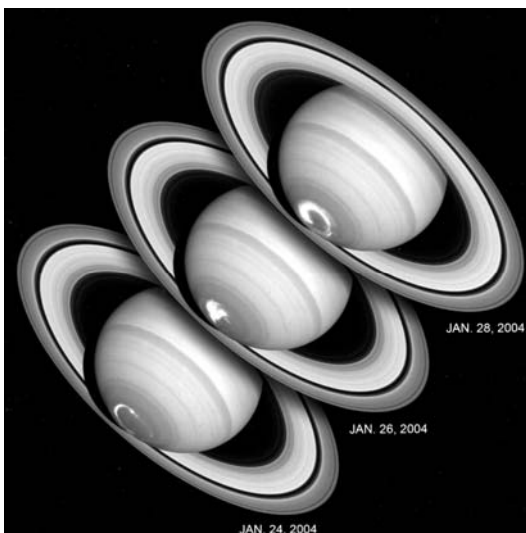
The documentary is divided into chapters, most of which concentrate on particular areas of astronomy in which the HST has made special advances (and that is most areas!).

The first chapter, *The Hubble Story* covers the history of the HST project, from the launch into space, the correction of the mirror defect with COSTAR and the subsequent maintenance missions, to the plans for its eventual dive back to Earth.

Hubble up close describes the instruments that make up the HST, with details of how they work, and the work of the principal groups of astronomers who are the main users.

Planetary tales includes the discovery of Sedna, the destruction of comet Shoemaker Levy 9, and the search

The unusual behaviour of Saturn's auroral rings round the poles was observed using the HST. This phenomenon will be the subject of closer observations from the Cassini space probe. Images such as this are stunningly re-produced on the DVD



for planets beyond the Solar System.

The lives of stars describes the work of Hubble in the examination of stellar nurseries such as the Eagle Nebula's "Pillars of Creation", the study of the life of stars from their creation to destruction, and the detailed views of the accretion discs around new stars in the Orion Nebula and elsewhere. It goes on to describe the death of stars, novae, and the formation of planetary nebulae.

Cosmic collisions investigates the interaction of planets, stars, galaxies, and cosmic gas and dust with each other.

Monsters in space deals with the speculations about black holes and wormholes, centres of galaxies, and quasars.

Gravitational illusions is a chapter about gravitational lensing, predicted by Einstein, and found in detail by Hubble around clusters of galaxies. Then the role of dark matter and the problems of measuring it are described.

The birth and death of the universe introduces some of the cosmological advances that Hubble has stimulated such as the rate of expansion of the universe through



The Hubble Space Telescope has completed 15 amazing years of work, and is still going strong. The analyses of the results of all these observations may keep astronomers busy for lifetimes to come!

the measurement of extreme distances. The role of Cepheid variables singled out in distant galaxies by Hubble which could then be compared with the light levels giving distance estimations for much more distant supernovae, has allowed astronomers to estimate the age of the universe with increasing precision. It has also thrown up the enigma of the apparent change from gravitational slowing down to the anti-gravitational speeding up of the expansion of the Universe. This has added a new term for the end of the Universe in which perhaps matter itself will ultimately be flying apart - the "Big Rip". (However, it is not made clear that this is a very recent theory that many astronomers do not hold to be the last word in the explanation of the observed data).

Looking to the end of time is the final chapter that talks about "astro-archeology". In 1995 Hubble looked at the same apparently empty part of the sky for a massive ten-day exposure. It found thousands of new galaxies at the greatest distances, and over a larger range of distances than ever seen before. This gave a new view of the evolution of galaxies. The ultra deep field exposures in 2003 and 2004 exceeded even this, and gave a glimpse of the end of the so-called "Dark Ages" of the Universe marking the formation of the first stars and galaxies (which apparently took place in a howling wind!).

The James Webb telescope is due for launch in 2011 and the life of the HST is still a matter of concern until then.

As a good all round entertaining astronomy lesson, this DVD is excellent, and reflects the great strides made in so many areas thanks to the discoveries made through Hubble. The interest never flags, and the commentators (Bob Fosbury and Howard Cooper) do a great job.

As a professional film, however, it is let down a bit by some rather silly clichés, both spoken and visual. At one point, for example, we see planetary nebulae pinned to a butterfly collector's board after having earlier remarked that, like butterflies, no two of these nebulae are the same, and the script once or twice even veered dangerously close to quotes from Douglas Adams!

The background music is pleasant enough (and is available separately on a CD) but, as all too often in science documentaries, it never ceases, so eventually becomes rather tiresome. And when will an astronomical documentary directory produce a visualisation of violent events in space (such as the Big Bang!) without silly sound effects of explosions or wind, with all the bad science that implies?

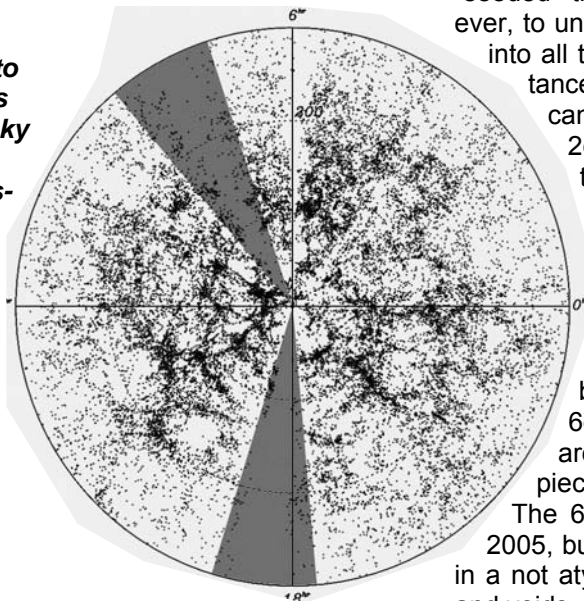
The DVD and many other aids and publications to mark the 15 years of HST are available as explained on the Hubble website www.spacetelescope.org

Richard Knox

Letter from Japan UMOQ

Since 1988, the Anglo-Australian Observatory has operated not just the 3.9-metre Anglo-Australian Telescope (AAT), but also the 1.2-metre United Kingdom Schmidt Telescope (UKST). What the UKST lacks in aperture, it makes up for in field-of-view; a single photographic plate can cover a 6 x 6 region of sky. Throughout the late-1970s and early-1980s, the UKST surveyed the entire southern sky in both blue and red photographic bands, providing an endless stream of new and intriguing targets to be followed up with the AAT, as well as the basis for the Digitised Sky Survey produced by the Space Telescope Science Institute. A second-epoch survey was carried out in the mid-1990s, yielding objects of high proper motion, many of which turned out to be new members of our solar neighbourhood. The last great photographic survey to be carried out at the UKST

Map of the distances to some 120,000 galaxies across the southern sky obtained with 6dF, showing galaxies clustered along filaments, separated by relatively empty voids. The two gaps near Right Ascension 8^h and 17^h are where the dusty plane of our Milky Way obscures our view of the Universe.



used a narrow-band filter, and fine-grained red-sensitive film to highlight the ionized hydrogen emission from star-formation regions, planetary nebulae, supernova remnants, emission-line stars and the like, in the Galactic Plane as well as in the Magellanic Clouds. With several new wide-field CCD cameras coming on-line on larger telescopes, the UKST's days as a camera seemed numbered. However, thanks to the fibre-optics technology pioneered at the AAO, the UKST has had a new lease on life as a wide-field, multi-object spectrometer.

The first attempts at positioning fibres at the focal plane of the UKST, to feed light from targets to a spectrograph on the dome floor, required astronomers to spend hours working in a fume cupboard while painstakingly gluing fibres on to a glass plate.

Not surprisingly, a better solution was needed, and it came in the form of the 6dF (for 6 degree Field) robotic fibre positioner and spectrograph. 6dF in fact started life

as a prototype for the larger OzPoz fibre positioner built for the European Southern Observatory's Very Large Telescope by the AAO. Having demonstrated that a robot could pick and place fibres by moving in and out radially along a curved rotating arm, 6dF was then pressed into service on the UKST, for positioning fibres on magnetic buttons onto a metal plate, which is then mounted in place of the photographic plate holder inside the UKST. In the meantime, up to 150 fibres can be positioned on a second plate, ready to swap with the first one after observations are complete.

Since 2001, three quarters of the dark and grey nights (those within a week or so of New Moon) on the UKST have been devoted to the 6dF Galaxy Survey (6dFGS). Why another survey of galaxies? Between 1998 and 2001, the 2dF instrument on the AAT mapped the distances to 220,000 galaxies in two thin slices of the sky, giving us the clearest picture yet of how the Big Bang "seeded" the formation and clustering of galaxies. However, to understand where our own Milky Way Galaxy fits

into all this requires that we map the location and distance to galaxies in every direction. Such a survey can be done almost ten times faster with 6dF than 2dF. Another way that the 6dFGS differs from the 2dF survey is that galaxies have been selected based on their infrared brightness measured by the 2 Micron All-Sky Survey (2MASS), rather than their optical brightness. Infrared radiation (heat) is a better indicator of a galaxy's mass than its optical emission, which can be artificially enhanced by just a few bright stars, or suppressed by dust. Thus, the 6dFGS will show us where the galactic "bullies" are, the galaxies which tug at and help shape our piece of the Universe and the galaxies within it.

The 6dFGS is due to be completed by the end of 2005, but already the attached map shows that we live in a not atypical region of space, surrounded by clusters and voids.

When the Moon is too bright to allow the spectra of faint galaxies to be taken, 6dF turns its attention much closer to home. Many of you will be familiar with the Astrometrics Lab featured in "Star Trek: Voyager". Imagine being able to stand in a room, and be able to call up the locations, distances, speed, chemical composition, etc. of any star you can see in your own backyard. Effectively, this is the goal of the RAdial Velocity Experiment (RAVE), which aims to build up just such a database from stellar spectra with 6dF. Before RAVE, only about 20,000 stars in the sky had spectra published in journals. RAVE reached this same total in just the first 6 weeks of observing! The total is now approaching 80,000 stars but the ultimate goal of 50 million stars will need a successor to 6dF capable of observing thousands of stars simultaneously. But if there's one telescope that's not yet ready to retire, you can bet it's the UK Schmidt!

Stuart Ryder

 sdr#aaoepp.aao.gov.au

Sky Diary Summer 2005

Firstly an apology for a silly error in the title of this feature in the last issue: it should have been "Sky Diary Spring 2005" not "Winter", and the very first words in the article were "Summer is icummen in" No one seemed to notice anyway!

Jupiter and Venus hover about low in the evening twilight during most of this quarter, which includes the Au-

turn Equinox. This is at the memorable time of September 22d 22h 22m (actually 23minutes - but who will notice?). By this time, the southward movement of the Sun across the celestial sphere will be taking its daily toll on the hours of daylight, and by the middle of the quarter the evenings are becoming nicely dark earlier. As has been said before in this Diary, the far south constellations of the Zodiac like Scorpius and Sagittarius are getting closer to the Sun (actually the Sun is doing the easting, of course) ☞ **7**

☞ but because twilight is shortening noticeably, some of the best chances of seeing the southern zodiacal groups are to be had during August evenings. Look for the “Teapot” of Sagittarius (due south very low in the map), and the bright red star Antares in the midst of the scorpion’s claws (just setting ahead of Sagittarius in the map).

Do these groups of stars form patterns that look like teapots and scorpions? Some of the comments that attendees at planetarium shows make suggest that the early astronomers who named the constellations had excessively vivid imaginations! In the Summer evening skies there are plenty of examples to try out. Visible throughout the quarter, Cygnus, the Swan, marks the rift of darker dusty matter that partially obscures the centre line of the Milky Way that can be seen in the map below.

But why was it not called the Northern Cross? It is a far better cross-shape than the Southern Diamond. Apart from the accidents of history (the cross had no particular significance at the time the group acquired its name, and the Southern Cross was unknown). Actually, it is not a bad Swan at all. Look at the Cross on its side, then the bright star Deneb, which means “tail” marks that spot, the lovely double star Albireo, that marks the foot of the Cross becomes the head, at the end of a long outstretched neck, and the arms of the cross become the wings.

Moon phases for the third quarter of 2005				
	New Moon	First Quarter	Full Moon	Last Quarter
July	6	14	21	28
August	5	13	19	26
September	3	11	18	25

Two tiny constellations can just about be seen on the map: Sagitta, the arrow, immediately north of Altair (the southern point of the so-called “Summer Triangle” that straddles the dark rift in the Milky Way) and Delphinus, the Dolphin, immediately to the east of Altair and on the southern edge of the Milky Way. Both these could scarcely be better to justify their names. It is interesting to show a photograph of Delphinus to someone and ask them to guess what the group is called. By contrast, find Andromeda, basically three or four medium bright stars strung out in a long, gentle curve between the Great Square of Pegasus and Perseus. She is represented as a scantily clad haplessly chained by the wrists to the rock awaiting the arrival of Cetus. Imagination or what?

Some important events during the quarter include the Perseid meteor shower which are due to reach a maximum at 13h (broad daylight) on August 12, but which will be worth seeing that evening as the Moon sets at 21hr 50min. The radiant, in Perseus, is shown in the map. The Perseids can be seen over several nights, possibly as early as July 23 and on till August 20. They are described in the Meteor Diary of the BAA Handbook as being “a rich shower with fast meteors, and a high proportion of bright events leaving persistent trains. Good photographic target.”

Other good photo opportunities arise from conjunctions of the Moon and planets.

This quarter offers only a few, but watch **8** for the close approach of the Moon to

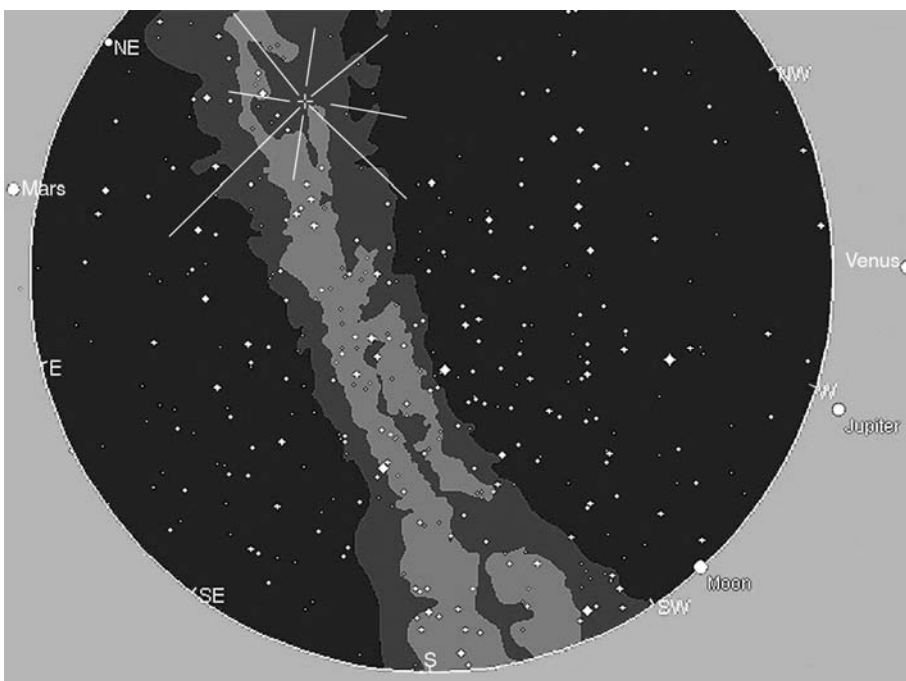
the south of Jupiter, by just over a Moon diameter, on July 13th during twilight. Then a fairly close conjunction will occur between the two brightest planets, Venus and Jupiter between September 1 and 2. Although the closest ap-

Rising and setting times (UT): lat.52°N; long.3°W						
	July 15		August 15		September 15	
	Rise	Set	Rise	Set	Rise	Set
Sun	05h 08m	21h 26m	05h 54m	20h 37m	06h 44m	19h 29m
Mercury	07h 40m	22h 18m	05h 00m	19h 44m	06h 21m	19h 33m
Venus	07h 39m	22h 45m	09h 15m	21h 43m	10h 47m	20h 32m
Mars	00h 30m	13h 40m	23h 03m	13h 18m	21h 26m	12h 23m
Jupiter	12h 38m	00h 10m	11h 00m	22h 15m	09h 31m	20h 22m
Saturn	05h 52m	21h 47m	04h 12m	19h 56m	02h 30m	18h 03m
Uranus	23h 09m	09h 51m	21h 05m	07h 44m	19h 01m	05h 35m
Neptune	22h 19m	07h 39m	20h 15m	05h 32m	18h 12m	03h 26m

proach will be at midnight, the setting planets low in the west should be easily visible in the evening twilight of the first day of the month. Mars will be reaching magnitude zero at the very beginning of the quarter, and will continue to brighten as it moves further north for the rest of the year. Mars will be moving across Taurus for most of the year, and it is a perfect target for observing the retrograde motion of the superior planets as they near opposition. Mars’ westward motion across the stars begins at the end of the quarter, and continues for most of the last quarter of the year. This is easily seen with the unaided eye, but with a simple home-made angular measuring device, such as a cross-staff, the positions of the planet can be plotted against the stars for the whole of the second half of this year.

Because Mars (and Venus) are relatively close to the Earth and so have comparable sidereal periods (the planets’ “years”), their synodic periods (the time they apparently take to cross the celestial sphere once are the longest of the planets, and Mars longer than Venus’ at 780 days. This means that watching Mars often gives the impression that it is always keeping ahead of the Sun during the year, until at last the Sun catches it up and during a long period either side of that conjunction we don’t see Mars at all, it seems.

Richard Knox



The sky as seen from the middle of the UK at 2005 August 12 21:50 UT showing the position of the Perseid meteor radiant at moonset. Planets below the western horizon have just set. Mars is about to rise on the eastern side of the sky.