Gnomon

Newsletter of the Association of Astronomy Education

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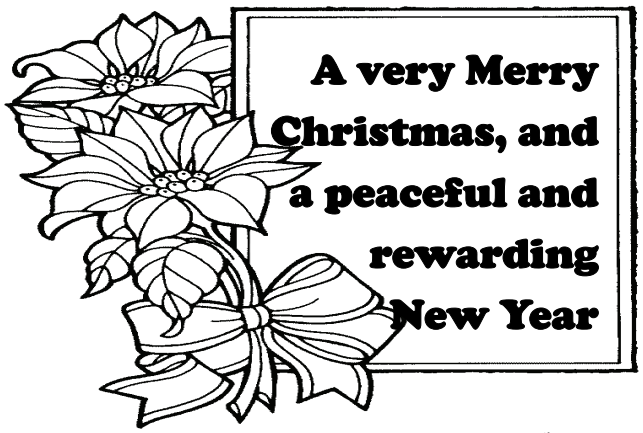

Welcome to IYA2009/ Telescope400

The first international Year of Astronomy is about to begin with the aim of communicating the excitement of astronomy and space science more widely than ever before in the UK and elsewhere in the world.

Here in the UK there are a large and growing number of projects planned – the website to go to for information throughout the year is:

www.astronomy2009.co.uk

Telescope400 plans to celebrate the 400th anniversary of a unique moment in the history of astronomy. Thomas Harriot, an unsung hero of UK science, used a telescope, itself a recent invention, to make the first-ever observations of the Moon from his residence in the grounds of Syon House, Middlesex, on July 26th 1609.

Events in Telescope400:

1) An astronomy-based family day at Syon Park on Sunday, 26th July: Children and adults will have the opportunity to take part in a wide variety of activities including observing the Sun with solar telescopes, making and taking home simple sundials and star finders and competing to produce the most powerful water-powered rocket. There will also be an exhibition of astronomical material, both historical and contemporary. This will include high quality copies of many of Harriot's drawings and maps - of lunar features, sunspots and the motion of Jupiter's satellites

2) The unveiling of a permanent memorial to Harriot in the grounds of Syon House, close to the site of his residence

3) An Evening Reception at Syon: A ticketed event, featuring a lecture "Thomas Harriot: the Englishman

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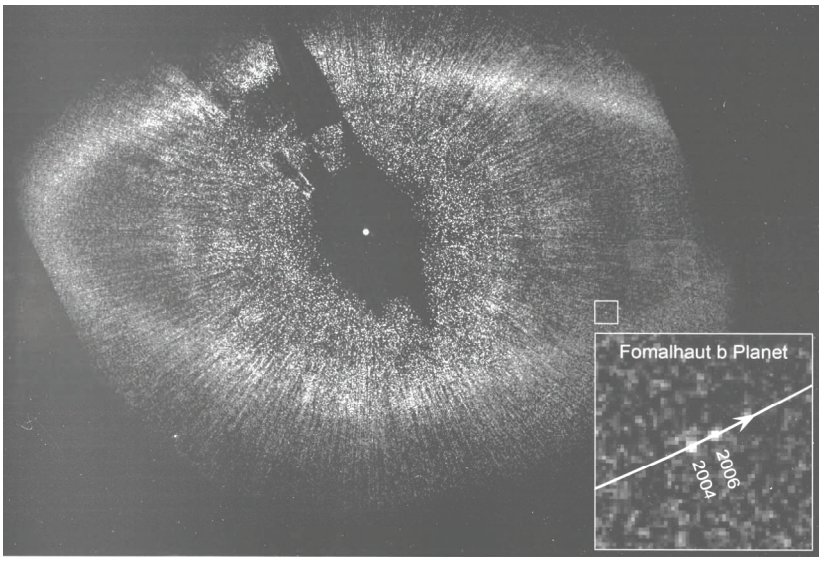
Another Hubble first: a photo of a planet not of our Sun

An historic photograph (reproduced here with contrast highly enhanced) is a planet circling Fomalhaut (α Piscis Austrinus, the Southern Fish, the most southerly naked-eye star easily seen from British latitudes). Labelled Fomalhaut b, it was the result of a search triggered by the discovery of an excess of dust around the star in the early 1980s by the US- UK-Dutch Infrared Astronomy Satellite (IRAS). In 2004, the coronagraph in the High Resolution Camera on Hubble's Advanced Camera for Surveys produced the first-ever resolved visible light image of a large dust belt surrounding Fomalhaut. It clearly showed that this structure is in fact a ring of proto-planetary debris some 34.5 billion kilometres across. This large debris disk is similar to the Kuiper Belt, which encircles the Solar System and contains a range of icy bodies from dust grains to objects the size of dwarf planets, such as Pluto. Hubble astronomer Paul Kalas of the University of California, and team members proposed in 2005 that the ring was being gravitationally modified by a planet lying between the star and the ring's inner edge. Circumstantial evidence came from Hubble's confirmation that the ring is offset from the centre of the star.



NASA, ESA and P.Kalas (University of California, Berkeley)

The sharp inner edge of the ring is also consistent with the presence of a planet that gravitationally "shepherds" ring particles. Independent researchers have subsequently reached similar conclusions. The Hubble Space Telescope has now actually photographed a point source of light lying 3 billion kilometres inside the ring's inner edge, even though Fomalhaut b is 1 billion times fainter than the star, and was revealed in the 14 November issue of **Science.** ***Observations taken 21 months apart by Hubble's Advanced Camera for Surveys coronagraph show that the object is moving along a path around the star (see photo inset)***

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who beat Galileo", to be given by Dr Allan Chapman of the University of Oxford - in the Great Conservatory.

There is a website which will publicise the July event and carry material throughout 2009 relating to Harriot's life and achievements:

💻 www.telescope400.org.uk

The Project website is being added to all the time and will keep up to date with details and plans as they develop.

Telescope400 has been made possible by the award of a grant from the Royal Astronomical Society in order that this anniversary should not pass unmarked here in the UK, and to ensure that Harriot's achievements receive due acknowledgement in 2009, the International Year of Astronomy.

For Your Diary

The first "Sky at Night" of 2009 on January 4th is to be a special programme on 'The Telescope' presented by Dr Allan Chapman. It will feature Harriot and the British contributions to early telescopic astronomy.

What is special about 2009?

If I say to you "What is special about 2009?", you would probably mention the International Year of Astronomy. You would be right of course but you would be missing the most important thing. That is of course the completely brand new AAE website. Behind the scenes for a long while now we have been working hard to bring you something a little more special. So look out at the start of 2009 for the brand new aae.org.uk. It will look slicker and contain much more information. All members will have the ability to log onto the site and get access to members only additional information. You will be able to access all our current features such as "Ask an Astronomer" but also get direct access to our Yahoo! Group without having to actually visit the site separately. The site will also host our shared teaching resources and as much astronomical data as we can squeeze in. If members have anything they want to contribute to the site then their resources will be more than welcome.

Details for logging in will take time to process but keep an eye out in your mailbox. It is important though that the AAE have your up-to-date email address in our database so please contact us if this has changed. We also want your ideas so make sure you contact us online.

James O'Neill

☞ **Another Hubble first** (cont. from page 1) and so is gravitationally bound to it. The planet is 17 billion kilometres from the star, or about 10 times the distance of the planet Saturn from the Sun.

The planet's upper-mass limit is constrained by the appearance of the Fomalhaut ring. If the planet were much more massive, it would distort the ring, and the effect would be observable in the ring's structure. Numerous computer simulations show that circumstellar disks will be gravitationally modified by the tug of one or more unseen planets. The Fomalhaut ring has a sharp inner edge that is likely shaped by the gravitational influence of a planet. The inner edge of our Solar System's Kuiper Belt is similarly shaped by the gravitational influence of Neptune.

The planet is brighter than expected for an object of three Jupiter masses. One possibility is that it has a huge Saturn-like ring of ice and dust reflecting starlight. The ring might eventually coalesce to form moons. The ring's estimated size is comparable to the region around Jupiter that is filled with the orbits of the four largest satellites.

Because the Fomalhaut system is only 200 million years old, the planet should be a bright infrared object. That is because it is still cooling through gravitational contraction. However, ground-based telescopic observations at infrared wavelengths have not yet detected the planet. This also sets an upper limit on its mass because the bigger the planet, the hotter and brighter it would be. Kalas and his team first used Hubble to photograph Fomalhaut in 2004, and made the unexpected discovery of its debris disk, which scatters Fomalhaut's starlight. At the time they noted a few bright sources in the image as planet candidates. A follow-up image in 2006 showed that one of the objects is moving through space with Fomalhaut, but changed position relative to the ring since the 2004 exposure. The amount of displacement between the two exposures corresponds to an 872-year orbit as calculated from Kepler's laws of planetary motion.

The planet may have formed at its location in a primordial circumstellar disk by gravitationally sweeping up remaining gas. Or it may have migrated outward through a game of gravitational billiards, where it exchanged momentum with smaller planetary bodies. It is commonly believed that the planets Uranus and Neptune migrated out to their present orbits after forming closer to the Sun, and then gravitationally interacted with smaller bodies.

Fomalhaut is much hotter than our Sun, and 16 times as bright. It is burning hydrogen at such a furious rate through nuclear fusion that it will burn out in only one billion years, which is only 10% of the lifespan of our Sun. This means there is little opportunity for advanced life to evolve on any habitable worlds the star might possess.

Future observations will attempt to see the planet in infrared light and will look for evidence of water vapour clouds in the atmosphere. This would yield clues to the evolution of a comparatively newborn 100-million year-old planet.

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There will generally be a 10% discount to AAE members on all publications and advertising rates.
Practising teachers may claim their subscriptions as an allowance against income tax, 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
📻 **gnomon_editor@talktalk.net**
Telephone: 01736 362947
Any photographs sent to the Editor by email (preferred) should be sent in a common format (TIF or JPEG) with resolution not less than 300 dpi

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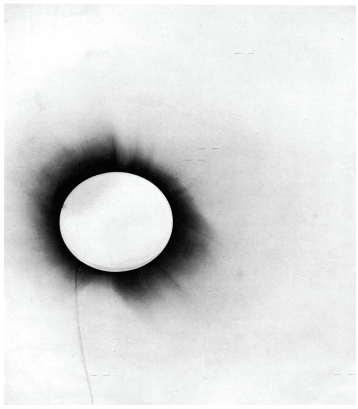
These are at the equinoxes and the solstices, that is four times a year. Copy deadlines are six weeks before these dates.

Observations

The ignorance about science displayed by the popular media is becoming embarrassing, and reflects dreadfully on our deteriorating education standards.

There was a most enjoyable one-off drama on BBC 2 towards the end of November with David Tennant (Dr. Who) as Sir Arthur Eddington, and Andy Serkis (Gollum!) as Einstein.

Basically it told of the publication of the Special Theory of Relativity, and how this was received with such enthusiasm by Eddington in England. After the war (WW1) Eddington set out to an island off the west coast of Africa to observe the stars during a total eclipse of the Sun in May 1919. He photographed the stars to try and verify Einstein's prediction that their position when close to the Sun in our sky would apparently change due to the bending of space by the Sun's gravitational field. One of Eddington's photographs is reproduced here.



The eclipse of the Sun as photographed by Sir Arthur Eddington, 1919 May 29. The brightest stars are just visible, and are marked between two lines each (these may not be easily visible in* Gnomon *so try the website **en.wikipedia.org/wiki/Sir_Arthur_Eddington**

But at a time when Dr. Who has graduated from monsters in rubber suits, for this production, it seemed, no effort was too small for special effects. They gave a totally misleading simulation of a total solar eclipse and the all-important visibility of stars during one, which is odd considering the vast amount of film/video footage available. The worst, of at least five serious howlers committed, included the sudden appearance of brilliant stars around a solar disc about half way between first and second contact.

In its publicity for the programme during the run up to transmission, Eddington himself was described with terms suggesting he was "an obscure physicist", a "little-known British scientist", and so on. Perhaps Einstein eclipsed everyone at the time by comparison, but the fact that BBC producers had not heard of him did not warrant such descriptions. Compare this with the references to Eddington in the new Hubble Telescope DVD (reviewed on page 5.)

About the same time as this programme went out, *Gnomon* received the photograph (on page 1) taken by the Hubble Space Telescope showing a planet going round a star other than ours. Before the HST, nobody had ever seen the disc of any star other than our Sun, let alone a planet going round one.

Our contributor Bob Mizon also was stunned by this lack of any understanding by the popular press of the historic importance of this development. He compared the discovery of Fomalhaut b with that of Uranus and Neptune.

Just as this is going into page, the Royal Society of Chemistry (*The Times,* November 27) has found that science and mathematics students seem to be receiving "record-breaking" results because their examination regimen and content has been progressively dumbed down over the past 40 years or so. This was tested by asking newly-qualilfied high flyers at science and mathematics A level to take equivalent papers set over the years, from the '60s to the present. There is no doubt that the *quality* of teaching in these areas is not to blame, but the content and the teaching objectives certainly has. No wonder that the appreciation and understanding of science by the general populace are taking an increasingly steep dive. The prospects for halting the drift of students away from science and mathematics get increasingly gloomy.

Richard Knox

School observing nights

What if your school or college does not have an observatory? What if you have street lights all around you? Organising observing evenings with children can then be a difficult and daunting task. What follows is just *one* way to overcome the problems of persistent cloudy evenings and many cancellations, but it worked for the astronomy group at Kings School Macclesfield.

It was decided that Tuesdays would be a regular night for observing. It was felt that it would be much easier for everyone to remember if the night was constantly being changed. The next year, however, it was decided to change to Fridays – so everyone could sleep in the following morning, especially in the Spring and Summer terms when it is quite late becoming dark enough to observe. An out of town venue was chosen that was reasonably free of light pollution up in the hills, but not so far away that parents would moan about providing the personal taxi service.

The involvement of parents was crucial in this venture. Not only had they to agree which was the best night of the week for them, and also to agree to bring their budding astronomers out of town, but they had to be prepared to wait in freezing conditions while we messed about with binoculars and the telescope. Actually, parents were very willing to do this. Most of them become very interested in the astronomy and one or two have even jumped the queue at the telescope eyepiece. The other great benefit of involving adults is that they are then responsible for their own sons and daughters on site and you are not beset with insurance problems because you are out of school.

A cascading telephone list allows information to be spread rapidly from the source, without caning just the one telephone bill. The cascade was set off at about 6.30 to 7.00 pm, talking directly to the first contacts who then phoned close friends. The message was always simple – the session was either ON or OFF (mostly the latter, of course) depending on the weather and the clarity of the sky. Only occasionally was it necessary to say "Well ☞

Some of the students from Kings School, Macclesfield Astronomy Group at Tegg's Nose Country Park, in a bitter wind under the stars. ***Photo: John Rex***

Curriculum Corner

I am writing to find out how teachers of the AAE are tackling the new KS3 science curriculum. I work at an 11-16 school in Sheffield and have really enjoyed the first term with the year 7s. My department have split up the course in to sections based on the previous national curriculum topics, grouping them together and giving them a theme. I of course jumped at the chance to teach "Be an Astronomer".

I have taught all Y7 groups in a rotation, this itself is new to me and has allowed me to develop my scheme of work over time. During the first term I have been teaching my version of unit 7K forces under the guise of an astronaut school. The pupils have loved the idea and I have taught them the basics of forces relating everything to working in space. The NASA and ESA archives of videos have given me great little examples to excite and inspire the pupils.

I have crammed in as many practicals as possible. My favourite has been the Helium balloon balancing lesson. Pupils are asked in pairs to balance a helium balloon in mid air by adding masking tape onto the end of the connecting thread. I could relate this to sending up weather balloons and high altitude science experiments. The results were fantastic and rewarding for all pupil ability levels. During the next two terms I am teaching topic 7J and 9J. I see myself firing lots of rockets and getting very messy with paper mache planets.

I would love to hear from other teachers with their ideas for teaching the new curriculum.

Please get in touch via our Yahoo! Group:
http://uk.groups.yahoo.com/group/astronomy-education/.

James O'Neill

Pluto: a reestablishment?

In Prague, on 2006 August 24 , the General Assembly of the International Astronomical Union reached the end of a week of intense debate on the official definitions of the various classes of objects within the solar system.

There were henceforth, it had decided, to be three categories of bodies orbiting the Sun: planets, dwarf planets and small solar system bodies. Some saw the transfer of Pluto to the second category as a demotion, nay, a humiliation, and the argument has rumbled on, to achieve such a pitch that the 'Pluto Protest video' is now yours to savour on You-Tube.

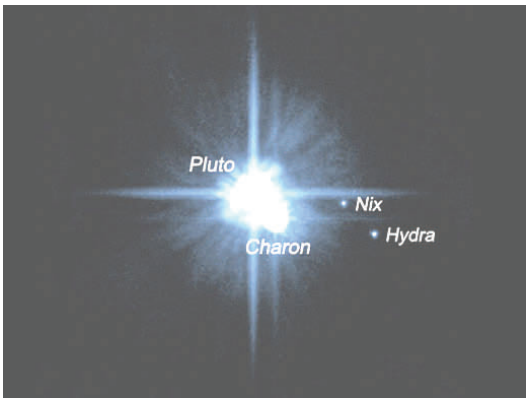
Montage of the Planets. NASA/JPL

What were the principal reasons behind Pluto's transfer? Certainly, it is small. Most people are surprised to learn that Pluto (diameter about 2400km) is considerably smaller than Earth's Moon (diameter 3475km). Its orbit is, to say the least, unusual when compared to that of the eight planets. But the major factor defining Pluto's new status is the nature of its neighbourhood.

Since 1930, when the patient and dogged Clyde Tombaugh finally identified Pluto through the lenses of his blink comparator, vast numbers of new objects have been discovered within the Solar System, remodelling our views of its contents, and what goes on out there. Strange and challenging objects have appeared, and the enormous amount of "rubble" outside the realm of the gas giants has gradually been revealed. Objects, some a thousand kilometres and more in diameter, have been detected beyond the orbit of Neptune.

The Kuiper Belt and the Oort Cloud are ever more frequently mentioned by astronomers. Pluto is just one of an enormous number of deep-frozen objects far out from the Sun, and there are doubtless many more to be discovered.

But really, why the fuss? One can understand the early reactions of Tombaugh's relatives and supporters to the apparent degradation of their late hero's discovery (he died in 1997), and one can sympathise with the schoolchildren who laid siege to a New York museum when one of their favourite planets was taken down from the display: but it is a fact that Pluto has been PROmoted rather than demoted. French astrophysicist André Brahic put the case well when he stated that, contrary to what people have imagined, Pluto has not been downgraded: it has achieved a new, grander status. Brahic cited Julius Caesar, who famously said that "it's better to be the ruler of the village than second-in-command in Rome". Pluto is now one of the "big players" in the icy and populous realm of trans-Neptunian bodies, instead of the runt at the edge of the realm of the planets.



Pluto and its Moons.
NASA, ESA, H. Weaver (JHU/APL), A. Stern (SwRI) and the HST Pluto Companion Search Team

Bob Mizon

☞ **(cont. from p.3)** it doesn't look very good but we'll try anyway". The cascade worked very well as the students were highly motivated, but one night they forgot to phone Sarah who missed out on the best night of the year and has never forgiven her friends!

In a whole school year you do not get many clear Tuesdays (or Fridays) but you do get a few. And on those nights everyone is there and it works. Naked eye observing can be followed by some binocular views of the Moon, star clusters, or the Orion Nebula. Binoculars *must* be mounted on tripods to give a steady image and so that they can be positioned ready for a beginner to view. A portable six-inch reflector was taken along that fits in the car boot and can be erected in minutes in a freezing wind.

It is a mistake to spend ages setting up, as people then get bored and go home. Then the more serious observing can begin. Saturn's rings, Jupiter's equatorial bands, double stars and a galaxy or two. An hour to an hour and a half is enough for a guided tour because once the students know their way around the night sky they can then spend more time at home following their own projects. Anyway you get too cold!

Good luck to anyone trying this kind of activity – all you need is committed people and patience and the belief that one Tuesday night soon will be clear.

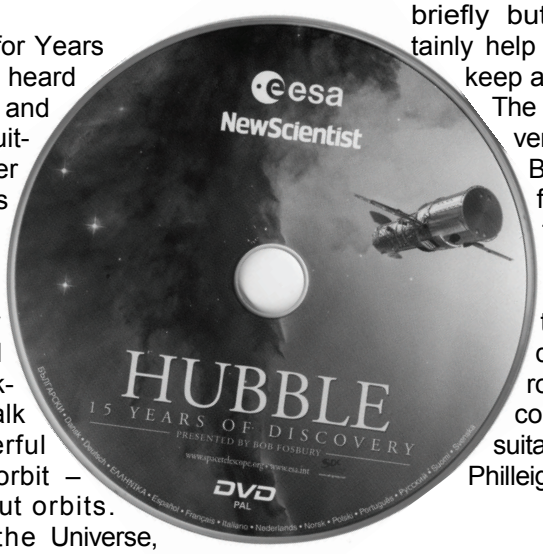
Anne Urquhart-Potts

For the New School Year

HUBBLE – 15 Years of Discovery. DVD running for over 90 minutes. Published by ESA. Free discs for AAE members (see text)

The Hubble Space telescope has opened our eyes to the incredible beauty of the Universe. It has penetrated deeper into space and further into the past than any other instrument, taken over 500,000 images, and it is not yet finished. This is the message of this educational DVD from the European Space Agency.

The narration is by Bob Fosbury, Lead Scientist at ESA/ESO, who takes us through nine chapters, each of about 10 minutes duration, which span the range of the discoveries made using the stunning images. These images form the backdrop to the story and are augmented by some good animations.



The presentation is fine for Years 9 to 11 (you need to have heard of infrared and ultraviolet) and some sections would be suitable for younger or older groups. Adult Ed classes will be transfixed.

The first two sections deal with the launch aboard the Shuttle *Discovery*, the story of the flawed mirror and the corrective optics package. There is a spacewalk sequence and wonderful views of the Earth from orbit – useful when teaching about orbits. After this we traverse the Universe, starting with the Solar System, the discovery of Sedna and the impact of Comet Shoemaker-Levy onto Jupiter.

"The Lives of Stars" starts with our Sun as a star, with close-ups of granulations and movies of flares. The commentary mentions nuclear fusion and is accompanied by animation of the p-p cycle. Photos in profusion illustrate all stages of a star's birth and death. Supernovae, planetary nebulae and white dwarf stars are all explained and also the important return of the heavier elements to the interstellar medium.

The number of galaxies in the Universe is illustrated by the famous "grains of sand on a beach" analogy – Bob Fosbury actually picks up a handful of sand. We are treated to wonderful animation of galaxies interacting which brings plenty of insight into the magnificent gallery of photographs which follows.

Black Holes, quasars and worm holes are treated briefly but accurately and these sequences would certainly help a teacher whose bright members of the class keep asking about these esoteric objects.

The final three sections deal with the very distant Universe, gravitational lensing, dark matter, and the Big Bang. The Hubble Deep Field observations of very faint, very distant objects give us a "peep-hole to the ancient Universe", showing us the first galaxies to emerge.

The whole programme is downloadable from the web site 💻 **www.spacetelescope.org** but the disk DVD is much more convenient for classroom use. To obtain your free AAE members copy, just send a stamped addressed envelope, suitably sized for a DVD, to me at Gwel an Vala, Philleigh, Truro, Cornwall, TR2 5NB.

Anne Urquhart-Potts

ESO-EAAE Summer School Granada 4th- 9th July 2008

It all began last March with a notice from Alan Pickwick on PTNC, the Physics teachers' email discussion list. He was advertising the summer school organised jointly by European Association for Astronomy Education and the European Southern Observatory.

After some tortuous EU paperwork I heard that I had received a Comenius grant to fund my place at the summer school – and that I had a place, so I booked my flights and looked forward to the conference. I am not an expert astronomer, though I am gradually learning more alongside the girls I teach in our Astronomy Club. I was looking forward to finding out about activities I could do with the girls and maybe some ideas for tips in teaching the cosmology topics we have in GCSE and at A level.

The summer school consisted of a mixture of lectures, workshops and visits. The lectures brought us up to date on some of the work taking place at the European Southern Observatory telescopes in Chile. The workshops generally included some practical activities – such as building sundials and telescopes. Several took advantage of the incessant sunshine to find the time, the date or our location.

We made a couple of visits within Granada. We went to the Parque de las Ciencias in Granada where they had a fascinating variety of sundials and an excellent planetarium – it took me back to the presentations John Ebdon used to do at the London Planetarium for Nuffield Physics groups. We also went to the Alhambra – who could go to Granada and not visit there?

Towards the end of the week, having had a workshop teaching us about how to observe and use our planispheres, we went out to Calar Alto, an observatory up in the mountains, where there are four large optical telescopes. We were able to go inside two of the domes and see the telescopes close up and also meet one of the astronomer technicians operating the telescope on the night shift. One of the highlights of the trip was lying on the ground after midnight (and not being cold!) with my planisphere and identifying more constellations than I had ever been able to see before.

It was a great week – I didn't stop talking about it for weeks afterwards, and I keep returning to the conference notes to remind myself of some of the ideas we looked at.

So if you get the chance to go next time – don't miss it.

Mary Whitehouse
Abbots Bromley School for Girls

School Hit by Asteroid – Wishful Thinking!

Want to see how big the crater will be if your school is hit by an asteroid or comet? Just go to the Impact Calculator web site and click Start.

The simulator, which as been developed by the National Museum of Wales, is easy to use. You can select the speed and angle of the impactor as well as its composition and the type of surface it is going to hit.

By clicking on the embedded Google Map you can centre the crater on your preferred spot. In addition you can see a depth profile and detailed data of the damage caused. To get a print-out you would need to take a screen-shot (Alt and PrtScn) and then paste into a document to print it. Good fun and serious science!

💻 http://simulator.down2earth.eu/index.html

Letter from Down Under

The rate at which massive stars exhaust their nuclear fuel, undergo core-collapse, and then end their lives in colossal supernova explosions has a huge influence on the evolution of their host galaxies. Supernovae drive the enrichment of gas by releasing the products of nuclear burning in their core into the interstellar medium, and possibly triggering the next round of star formation with their blast waves.

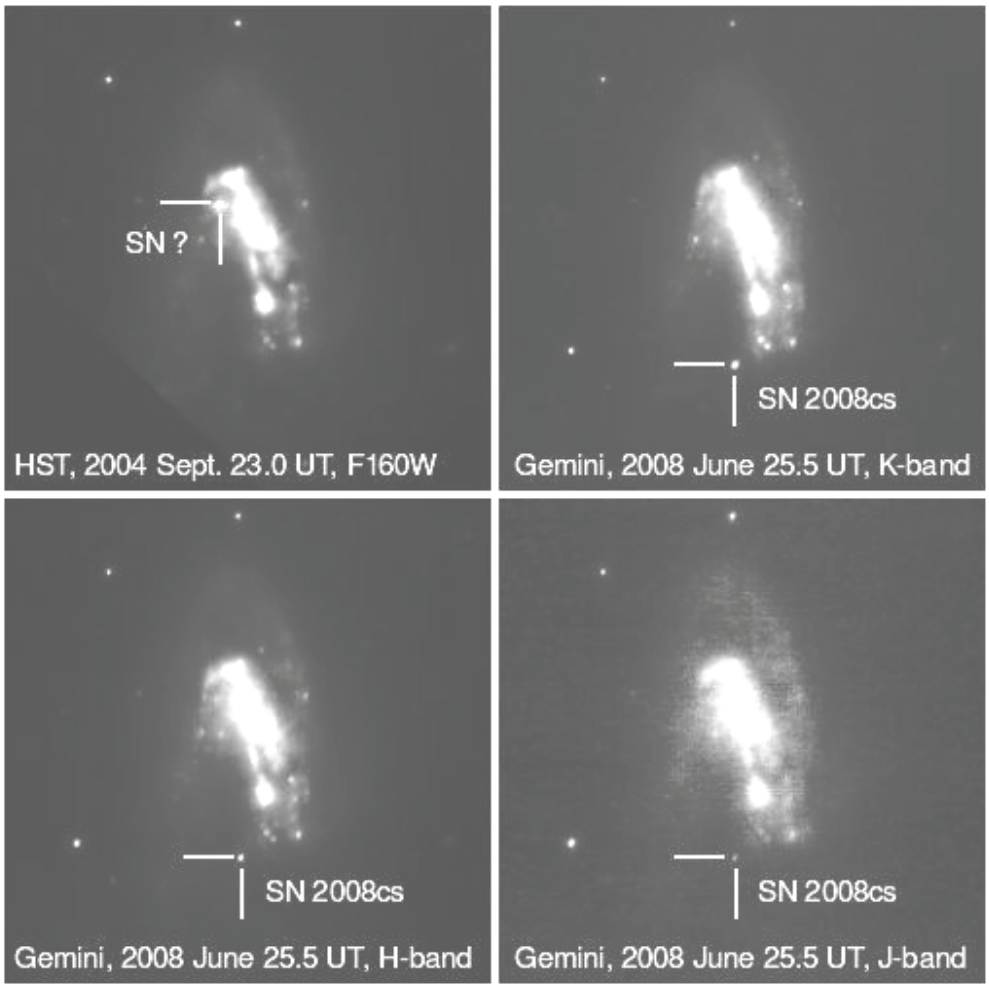
Stellar evolution theory, combined with recent identifications of actual supernova progenitor stars, indicates that only stars more massive than about eight solar masses will end their lives as core-collapse supernovae. Assuming that the ratio of such massive stars to less-massive stars (the so-called Initial Mass Function) is the same everywhere in the Universe, then the observed supernova rate provides a measure of the star formation rate which can potentially be employed right back to when the Universe was much younger.

Despite the efforts of dedicated amateur supernova hunters such as Australian Bob Evans, and robotic searches such as the Lick Observatory's Katzman Automatic Imaging Telescope, the only thing we know for certain is that the current rate of supernova discoveries is less than the actual rate of supernova events. But just how many supernovae are we missing? To give us an idea, we can examine the types of galaxies where supernovae ought to be occurring at the highest rates, namely those undergoing a starburst episode in which massive star supernova progenitors are being born at the highest rates. The class of starburst galaxies known as Luminous Infrared Galaxies (LIRGs) whose total infrared luminosity exceeds 1 trillion solar luminosities, and their more extreme cousins the Ultra-Luminous Infrared Galaxies (ULIRGs) that emit more than 10 trillion solar luminosities at infrared wavelengths, ought to be the ideal hunting grounds for supernovae. Yet barely a handful of the more than 4500 catalogued supernova discoveries were found in either of these types of galaxy. Why is this?

There are two main reasons. Firstly, these types of galaxy are incredibly dusty. Their dust absorbs nearly all the optical radiation emitted by the young stars and reradiates it at longer wavelengths, giving rise to their prodigious infrared luminosities. Secondly, both this dust and the tendency of stars to form in clusters result in these galaxies appearing extremely clumpy. As the nearest LIRGs are at least 130 million light years away, spotting a new point source against such a complex background in ground-based seeing conditions is extremely challenging. The availability of adaptive optics facilities on the 8-metre Gemini North telescope in Hawaii, which can undo the blurring effect of the Earth's atmosphere and deliver images 5 – 10 times sharper than before at near-infrared wavelengths, enables us to overcome both of these handicaps at one stroke.

Back in September 2004, a team led by Finnish astronomer Dr Seppo Mattila and I used the NAOS-CONICA adaptive optics system on ESO's Very Large Telescope to detect a supernova candidate in the LIRG IRAS 18293-3413 which had not been present in images from May 2004. Unfortunately it took a further two and a half years before SN 2004ip was officially recognised as such by the IAU's Central Bureau for Astronomical Telegrams (CBAT), and subsequently vindicated with our discovery of a radio counterpart using the Very Large Array. SN 2004ip was the first supernova ever detected using a natural guide star adaptive optics system. Encouraged by this success, and wanting to extend our supernova search to LIRGs which do not happen to have a bright enough natural guide star within reach, I have begun a program to use Gemini's laser guide star mode to image a set of nine LIRGs at intervals of three to six months over two years. Our simulations have indicated that this is the optimum interval to detect supernovae. Any longer than this and we risk allowing a supernova to rise to maximum and decline again without ever being caught, while more frequent observations would restrict the sample of galaxies we can monitor in the available allocation, and actually lower our chances of a discovery.

Remarkably, with just our third target observation we hit pay dirt! Normally we rely upon careful matching and subtraction of an earlier reference image of the same LIRG to reveal any new supernova candidate. The LIRG IRAS 17138-1017 had previously been observed with the NICMOS infrared camera on board the Hubble Space Telescope in September 2004. A simple visual comparison of our first Gemini image with this image (see photo) revealed in



Before and after images of SN 2008cs in the LIRG IRAS 17138-1017. The object marked "SN?" in the 2004 image has only recently been named By Central Bureau for Astronomical Telegrams as SN 2004iq.

fact not just one new supernova candidate in the 2008 image, but also one "historical" candidate from 2004 which is no longer visible. In subsequent Gemini re-observations, we have seen the new south-eastern source rise, then fall in brightness, and we have even detected it with the VLA. These results put the core-collapse supernova nature of this object beyond doubt, and CBAT soon conferred on it the designation SN 2008cs. For lack of any independent confirmation images they were somewhat more reluctant to acknowledge the 2004 object, but after ruling out all alternative explanations, we have just had it recognized as SN 2004iq.

By comparing the observed brightness and colour of SN 2008cs with similar nearby supernovae, we have found that SN 2008cs suffers from almost 19 magnitudes of extinction in the optical. Put another way, for every 33 million optical photons that left the supernova, all but one were absorbed or scattered by dust. If the famous Supernova 1987A had suffered this much extinction, it would probably have gone completely unnoticed for the first few years, until it became apparent at radio wavelengths. Thus, it is little wonder that so few supernovae have ever been found in LIRGs – they are there, but may be completely hidden by dust. Nevertheless, if these are the only two supernovae we find in our full survey, then the common assumption that massive stars are what makes LIRGs and ULIRGs glow must be seriously questioned. We hope to discover many more supernovae yet!

Stuart Ryder

sdr#aao.gov.au

Economic pressures should help the Dark Skies cause

In recent years, the cost of electricity has increased dramatically, resulting in councils being unable to meet the huge costs of keeping street-lights on throughout the night. In response to this, councils are now turning off street-lights overnight in numerous locations around the country.

At the time of writing (November 2008), 15 local authorities have switched off (mostly rural) lamps after midnight, one has switched off certain lamps permanently, and several others are considering the measure. It is obviously a popular move with astronomers, but what about those voices which are raised against such switch-offs, on grounds of safety and accident prevention?

For the last 20 years, the BAA Campaign for Dark Skies has been arguing against the use of inefficient outdoor lighting which wastes huge amounts of energy and money by shining light where it is not needed (into the sky, and into people's homes), or when is not needed (for example, on premises where nobody is about). Unfortunately, the Campaign's pleas for efficient outdoor lighting have frequently not been heard, and inefficient outdoor lighting is commonplace. It has been calculated that Europe sends £1,500,000,000 worth of energy skywards every year!

Capricornus rising, looking south east towards London Airport 20 miles away in 1974. Is it possible to see anything of this constellation from there now?
Photograph: Richard Knox

Large-scale switch-offs have often been met with dire predictions of crime waves, in spite of the fact that (as heard on the Jeremy Vine show on Radio 2 recently) many people who have lived in dark villages for many years seem quite comfortable with their night-time environment. There is currently no evidence to indicate that crime will increase with less lighting. Indeed, when Essex Council carried out a large-scale switch-off of street-lighting in early 2008, crime actually fell by a third in the areas studied. Such observations are not surprising. Street-lights are installed to help people see what they are doing in the darkness - unfortunately, that includes criminals who may otherwise be in unfamiliar surroundings.

The Campaign for Dark Skies believes that, while the large-scale switch-off of street-lights should not be greeted with fear, it would be better to replace genuinely needed or wanted street-lights with models that only shine light where and when required, and have the minimum power ratings for the task. In addition, since bright lighting is not required throughout the night, even in a city centre, dimmable street-lights should be used.

Such efficient lighting not only saves vast amounts of energy (and therefore money), but also reduces the impact on the surrounding countryside (city lights can be seen for over 100km). Indeed, if such lighting had been installed in the past, the large-scale switch-off of street-lights would not be occurring today.

The use of efficient lighting would also help restore the night-time to the dark, natural environment that nature intended, and the glories of the Milky Way and the night sky would be revealed to a generation that has never seen it before.

Bob Mizon

Sky Diary Winter 2009

A big welcome to the International Year of Astronomy (IYA). I am so excited and can't wait to use this fantastic opportunity to put more of my favourite subject into my day to day teaching.

So what is in the night sky and what interesting things have we for January 2009? Well for a start we have the Quadrantid meteor shower, which is very favourable on the night of the 3rd and 4th. Quadrantids are, like the Geminids, relatively slow meteors and the brighter shower members are sometimes strongly coloured blue or green. These "shooting-stars" all appear to radiate from a point in the now-disused constellation of *Quadrans Muralis*, between the bright star Vega and the "handle" of the Plough. The radiant point is directly north, and low down. With any luck, we may see one Quadrantid every couple of minutes.

Saturn is the planet of the month. Rising around 22:00 at the beginning of the quarter, and spending all night in a dark sky for the next three months, this impressive ringed planet is great to view through telescopes and ☞

Moon phases for the first quarter of 2009

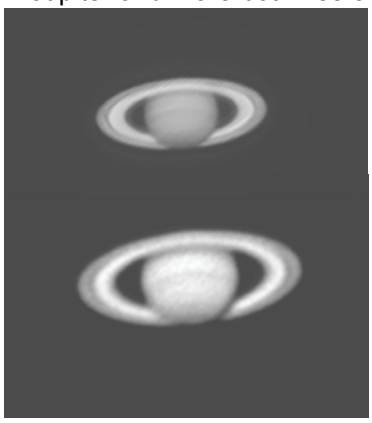
	New Moon	First Quarter	Full Moon	Last Quarter
January	26	4	11	18
February	25	2	9	16
March	26	4	11	18

☞ good binoculars. Binoculars allow you to see that the spot of light is in fact a planet. You may be able to identify an overall getting less easy to see now. Looking through a telescope is the best thing to do, and brings out the planet's "wow!" factor. To see that elusive gap in the rings, known as the Cassini division, you will need a fairly large telescope and a very clear night.

Giovanni Domenico Cassini the famous Italian astronomer discovered the main division of the rings in 1675. His name also is given to a spacecraft currently orbiting Saturn and asteroid 24101, which makes its closest approach to Earth (1.082 AU) on January 20th. 💻 **saturn.jpl.nasa.gov**

Venus is officially the IYA featured object for January. This bright inner planet can be seen just after sunset in the south-west. Half way through February it will suddenly dim dramatically and is engulfed by sunlight, not to reappear properly until next summer. It is a very interesting planet to observe. It is lovely to see something other than the Moon showing a beautiful phase. Remember to make sure the Sun has fully set before pointing a telescope or binoculars at Venus.

Jupiter and Mars both rise a little before the Sun but are not in dark enough skies to be of interest.



These images suggest how Saturn might look seen through 100 mm (top) and 200mm telescopes (bottom). However, in these pictures the rings are almost as wide open as they can be, as they were some seven years ago. Now, the rings look pretty slim! (

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Other points of interest for January include the Earth reaching perihelion on the 4th, at a distance from the Sun of 0.983 AU. The average Earth-Sun distance is 1 AU (nearly 150 million kilometres or 93 million miles).

As far as planets are concerned, February and March are similar to January, with Saturn alone available for dark sky observations. The planet is perfectly placed to be seen soon after sunset and will just get clearer and higher in the sky as the night goes on. Although Jupiter and Mars start racing away from the Sun, they are not becoming visible dawn objects. The morning line up of the planets is along an ecliptic almost lined up with the horizon, so they all rise at about the same time as the Sun (see the table) and are washed out in the morning sunlight.

The IYA featured object for the month during February are the "Craters of the Moon". The Moon is the perfect beginner's object and fantastic for pupils to observe. Remember the best way to observe craters is not when the Moon is full. When full it is very bright through optical instruments and very little contrast detail is seen. To see detail you must view craters at the terminator during other phases (such as the quarter and crescent phases). At these times the sunlight hits the surface at a shallower angle. The first quarter (six to nine days past new moon) is generally considered the best time to observe the Moon.

In fact why don't we all have an after school observing event on Friday the 30th January? Organise a telescope and ask your pupils to be at school to 18:00. You will be able to see low down in the south-west a bright object which is of course Venus (at an altitude of 25º). Directly above that will be the thin crescent of the Moon (altitude 30º). As a matter of interest, just below Venus will be Uranus, but it will be virtually impossible in the fading sunlight at magnitude 6.2. But is a good talking point! If you do manage to get group together don't forget to send in a report or photo to *Gnomon*.

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

	January 15		February 15		March 15	
	Rise	Set	Rise	Set	Rise	Set
Sun	08:13 ♐	16:28	07:26 ♑	17:26	06:26 ♋	18:16
Mercury	08:40 ♑	17:42	06:27 ♑	14:55	06:19 ♒	16:48
Venus	10:04 ♒	20:53	08:17 ♋	21:36	06:06 ♋	20:27
Mars	07:46 ♐	15:24	06:55 ♑	15:32	05:52 ♒	15:48
Jupiter	08:41 ♑	17:05	06:54 ♑	15:41	05:19 ♑	14:26
Saturn	21:35 ♌	10:39	19:24 ♌	08:35	17:17 ♌	06:38
Uranus	10:19 ♒	21:36	08:16 ♒	19:39	06:28 ♒	17:58
Neptune	09:29 ♑	19:04	07:25 ♑	17:05	05:37 ♑	15:20
Moon	21:23 ♌	09:43	00:14 ♍	09:01	— ♎	07:26

Data for other venues and dates can be estimated from this and Moon phase tables. Symbols after rise times show constellations where body is, at rising. & is a symbol "borrowed" for Ophiuchus, but not used in this quarter .

The Vernal Equinox is on the 20th of March. Equinox's occur twice a year when the tilt of the Earth's axis is oriented neither from or to the Sun, and so the Sun is located overhead somewhere along the equator. This is bringing enough daylight earlier in the morning and later in the evening to make it worth changing our clocks to British Summer Time, which this year happens on March 29th at 02: 00. This is the addition of an hour to the clocks. (Remember "Spring forward, Fall back"). You have been warned, so don't be late to work.

The IYA featured object for March is of course the object we have spent all year so far observing, Saturn. This would have been chosen I presume as Saturn is at opposition on the 8th. This is a great time to photograph Saturn as it is nearest to us. Also Saturn is near the two points in its 30-year (about) cycle in the Earth's sky (sidereal period) when the plane of the rings makes them almost line up with the Earth, so that they almost disappear from our view.

Let us all wish for a fantastic IYA and clear skies. Good luck with you observations and enjoy Saturn in all its glory.

James O'Neill

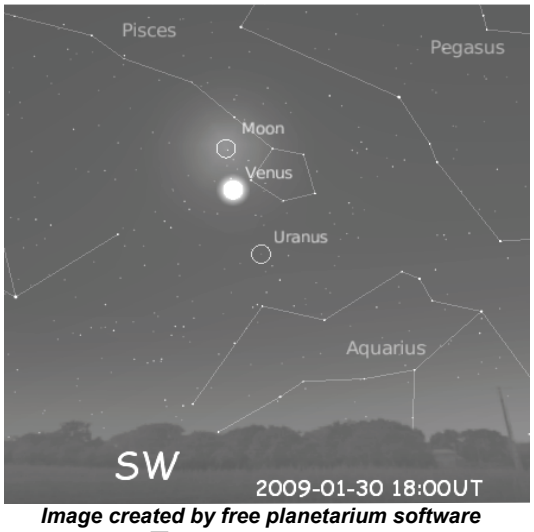

Image created by free planetarium software (💻 www.stellarium.org)