Observers' Forum

A celestial Christmas tree

Having finished decorating your terrestrial Christmas tree this year, you may care to step outside and view a celestial one. Well placed in the December night sky in the often overlooked but very rewarding constellation of Monoceros, NGC 2264, called the Christmas Tree by the American astronomer and writer Leland S. Copeland, lies due south around 1 a.m. in mid-December at an altitude of 50°. The cluster lies amid a vast area of nebulosity, well captured in the image by Gordon Rogers on the cover of this *Journal*.

The coordinates of NGC 2264 are RA 06h 40m 58s and Dec +09° 53'.7 (2000.0), but visual observers can sweep it up easily as it lies midway and slightly north of a line joining Betelgeuse and Procyon. An alternative route is to sweep 6° below 2nd magnitude γ (gamma) Geminorum, the lower ankle of the Gemini twins. In 10×50 binoculars the cluster, which is just over half a degree in size and lies at a distance of around 3,000 light years, will show around 20 stars arranged in an upside down triangular pattern; it takes an inverting telescope that puts south at the top to create the Christmas tree image.

Don't mistake the prominent thin little triangular asterism of stars that lies to the west and slightly to the north of NGC 2264 as the Christmas Tree. If you put this asterism, which looks like a miniature Sagitta but facing in the wrong direction, on the right hand edge of a typical 5° binocular field, then NGC 2264 will appear on the left hand side. Larger binoculars will show more stars, but I find the view in smaller glasses more appealing. Studying the cluster carefully will show a string of faint stars curving away from the trunk – perhaps a length of loose tinsel. NGC 2264 and the asterism are both shown on page 12 of *Sky Atlas 2000* (Sky Publishing 1998).

Don't expect binoculars to show any nebulosity. That will take a large telescope, very transparent skies and probably a nebula filter as well. In a 300mm telescope equipped with either UHC or O-III filter you might, if you have a very good site, see faints wisps of nebulosity, but nothing compared to that shown in Gordon's image. The total nebulosity in this complex extends to almost 2°.

The brightest star in the Christmas Tree, lying just above the centre of the picture, is the 5th magnitude giant S Monocerotis. This is traditionally taken as forming the base of the tree for visual observers. S Mon is an irregular variable star, ranging between magnitude 4.2 and 4.6. It is also a visual double, with a magnitude 7.5 companion just under 3 arcseconds away. Just below S Mon lies the patch of nebulosity known as the Fox Fur Nebula.

Image of NGC 2264 and its surrounding nebulosity by Gordon Rogers. (Also see the front cover).

At the top of the tree, and clearly shown in the image, is a V-shaped notch 5 arcminutes long known as the Cone Nebula. The Cone is another difficult visual target, although observers with large Dobsonians and good skies might just get a hint of it on one of those rare transparent nights. It is actually a foreground dark nebula, but will probably just appear as a star poor region at high power just south of the 6th magnitude star forming the tree's tip.

Stewart L. Moore, *Director, Deep Sky Section*

▸ producing sprays of debris, some of which were collected by the orbiting probe. A small lander called *Minerva* had also been employed to 'hop' around in the asteroid's low gravitational field, imaging its surface.

Mr Mobberley closed with a summary of recent asteroid occultations. As mentioned in previous Sky Notes, a particularly bright albeit short event was seen on October 19 – the occultation by 166 Rhodope of mag 1.4 Regulus, for a maximum duration of a mere 1.1 seconds. [As an unrelated aside, the speaker remarked what a peculiar star Regulus is, spinning much faster than the Sun, with a period of only 16 hours; it would only need to spin 10% faster to fly apart.]On October 19, its 'blinking' was observed across Europe, confirmed from two sites in Portugal, five in Spain, and one each in Italy and Greece. The occultation was not observable from the UK. From these timings, Rhodope's diameter was found to be 63km by 46km, in contrast to previous estimates of 35km.

After the applause for Mr Mobberley's lively summary, the President adjourned the meeting until 2006 January 25, at the new venue of New Hunts House, Guy's Hospital, near London Bridge.

Dominic Ford

1 Jenkins R. M., 'The Star of Bethlehem and the comet of AD66', *J. Brit. Astron. Assoc.*, **114**(6), 336–342 (2004)

A Ridley Grant put to good use

by Jonathan Shanklin

In 2004 I received a BAA Ridley Grant towards the purchase of a pair of binoculars and tripod for the visual observation of comets and variable stars, and for use during public demonstrations at the Cambridge Observatories. Tripod-mounted binoculars have two big advantages. The stability of the mounting allows increased light grasp during serious observation, which can amount to as much as a magnitude at times. Secondly, the parallel arm mounting allows the height of the binoculars to be adjusted to suit the individual without changing the field in view, a big benefit on nights when stargazers of varying heights and ages are present.

The tripod was installed on 2004 April 12 and the binoculars arrived a fortnight later. In the two years since then, I used the binoculars for observing variable stars on 55 occasions and for comet observation on 33 occasions (with considerable overlap!). In addition they have been in regular use during public observing sessions, which are held on Wednesday evenings during the winter months, and by members of the Cambridge University Astronomical Society. Members of the BAA have also used them, in particular at an observing session during the out of London meeting in September 2005. Further use has also been made of them by school groups, either at the Observatories or at their own school.

The Ridley Grants were designed to provide a lasting memorial to Harold Ridley and funded from his generous bequest to the Association. The tripod and binoculars have made a significant contribution to the work of the Association, both in encouraging visual observation and in educating the public. I am sure that Harold would have been delighted at the results.

Do you have an observing project for which a Ridley Grant may be appropriate? Ask for details from the BAA office, or logon to ***www.britastro.org*** *and follow the links through Information to Grants.*

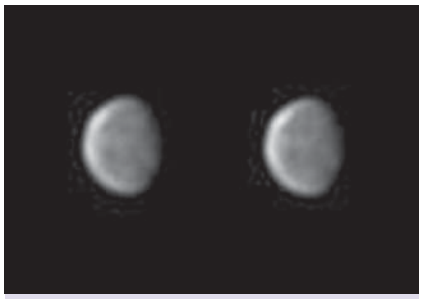
Webcam images of Mercury

The accompanying images of Mercury were obtained on the morning of 2006 August 19, during a short interval of good seeing. The telescope used was a 10-inch (250mm) Orion Optics (UK) Newtonian on a Vixen GP-DX mount, coupled with a Tele Vue ×5 Powermate to give a sufficiently large image scale. The camera was an ATIK 1 HS II black & white webcam, with a Baader IR-pass filter transmitting wavelengths longer than 685nm. Five movie files in .avi format were recorded over a half-hour period, after which the seeing deteriorated. The observations were made in full daylight: the dark background results from clipping the histogram during processing of the stacked images.

The images were processed from the best two movie files, and show the planet at a phase of 0.78, with the central meridian at Hermean longitude 131°. North is to the top and east to the left. The reason for presenting two images is to demonstrate that the light and dark markings are genuine features on the planet's surface, because they are present in two images derived from independent stacks of frames. Artefacts caused by noise would be random, and would appear in one image but not the other. The majority of the markings do appear on both images, and can thus be taken as real.

Locating Mercury in the daytime sky is not particularly difficult, but as the process inevitably involves pointing an unfiltered telescope not far from the Sun, caution is essential. The main requirement is an accurately polar-aligned equatorial mounting for the telescope. My preferred technique is to polar-align the mount the evening before, if possible, then in the morning put on the counterweights and telescope, and attach a sub-aperture solar filter securely to the front of the tube. Using a 25mm eyepiece, which gives a field of view of nearly 1°, the Sun is centred in the field and carefully focused. The telescope is then moved by pre-calculated amounts in RA and Dec to the expected position of Mercury, and the solar filter removed. At this point, Mercury should be visible as a tiny pale speck. Jiggling the telescope slightly, or alternatively switching off the drive to allow it to drift through the field, can make the planet more obvious. In either case the motion draws the attention of the eye more effectively than to a stationary point. I have located Mercury in this way when it was as faint as magnitude +0.5. Random sweeping near the Sun is very dangerous and should be avoided.

There is, however, one problem: it is very difficult to observe in daytime with the other eye open, as one normally does at night, and the focus of the open eye tends to change. To avoid this, I use an eyepiece with a pointer (a needle) mounted so its tip is at the centre of the field and in the focal plane. This keeps the eye that is being used focused correctly even while the other eye is closed, and in addition allows the planet, once found, to be brought to the centre of the field.



Images of Mercury recorded on 2006 Aug 19 at around 07:50 UT; see text. *Chris Hooker.*

Once Mercury has been found and brought to the centre of the field, I fit the Powermate. My setup uses a Borg helical focuser with a range of 10mm, and tests on a star have established the change of focus needed when the Powermate is introduced. The planet must then be found in the field again, and once more brought to the centre, so it will appear in the webcam field. A further small change of focus is then needed to give the sharpest image on the webcam chip.

With care and practice, the process outlined above can be completed in half an hour or less. One is then subject only to the normal frustrations of observing, i.e. the seeing and the weather. Western (morning) elongations of Mercury are more favourable, as the planet reaches an acceptable altitude for imaging while the Sun is still relatively low and the seeing has not deteriorated too much; the images shown were obtained during a morning elongation.

Chris Hooker

Anglo-Australian supernova discoverers

Four supernova discoverers took the opportunity to get together at the recent AGM of *The Astronomer* organisation, held on 2006 September 23 in Basingstoke. *From left to right:* Tom Boles (UK), Revd Bob Evans (Australia), Mark Armstrong (UK), Ron Arbour (UK). *Photo by Nick Hewitt.*

Meeting on Asteroids and Comets in Europe: MACE 2006

This year's three day meeting was held from May 12 to 14 at the Kuffner Observatory on the outskirts of Vienna. The 70-plus attendees (professionals and amateurs) from nineteen countries included three from the UK, Peter Birtwhistle, Richard Miles and myself.

The lectures, by both professional and amateur astronomers, formed four major themes: astrometry and photometry, remote observing, orbital dynamics, and impacts and impactors. A selection of presentations is described here. A fuller account will be published in *Impact,* the newsletter of the Asteroids and Remote Planets Section, and comet-related items will be expanded upon in *The Comet's Tale*, the newsletter of the Comet Section. The MACE web site is at **http://www.minorplanets.org/**.

Astrometry and photometry

Peter Birtwhistle (UK) and Monty Robson (USA) described their joint efforts to determine the distances to Near Earth Asteroids by simultaneous (to the nearest second) imaging between 2004 and 2006. They showed that accurate estimates of distance could be obtained far more rapidly than with conventional methods. For example, less than two hours of joint observations allowed them to calculate the distance to 2004 XJ as accurately as JPL from thirteen days of data.

A Follow Up Astrometric Program (FUAP) concentrating on main belt asteroids not observed for some time was introduced by C. Cremaschini (Italy). The program selects from the MPCORB database asteroids brighter than magnitude 18 (the user may change this parameter) that have not been seen for up to five possible oppositions. This would appear to be a useful program for those with more modest equipment. The web site can be found at **http://asteroidi.uai.it/fuap.htm**.

Raoul Behrend (Switzerland) argued the case for paying more attention to photometry now that the increasing number of automated surveys means fewer opportunities for astrometrists. Light curves can support 3D modelling, radar imaging and determination of the pole position, and may indicate that the asteroid is binary in nature. Raoul pointed out that, while readily available software can make analysis much easier, good quality images are an absolute necessity. Initially, to gain experience, slow-moving, short-period objects should be targeted. All images must be calibrated (application of dark frames and flat fields) and one should check that flat fields really are flat.

Petr Pravec (Czech Republic) described the 'Photometric Survey for Asynchronous Binary Asteroids, and other opportunities for asteroid photometrists'. The light curves of these binaries are quite complex as they reflect the rotation of both bodies and eclipses of one by the other. The size and period of the primary body indicate that they are close to the 'spin barrier' above which a 'rubble pile' asteroid would disintegrate. Studies suggest that 15 ± 4% of NEA's are binary in nature. Experienced amateur photometrists may join this professional programme.

G. Sostero (Italy) shared 'Some thoughts about cometary CCD photometry'. He described a number of problems associated with imaging comets: what size photometric aperture to use for measuring images (*e.g.* equivalent to 100,000km at the distance of the comet), determining where the coma ends and the sky background begins, stacking of frames to obtain a reasonable SNR, and the need to provide suitable reference star sequences. Different approaches are necessary for different targets and narrow band filters may be required. The CARA (Cometary Archive for Amateur Astronomers) web site can be found at **http://cara.uai.it/**

'Lightcurve photometry of fast-moving asteroids by simultaneous V- and I-band calibration of field stars' was described by Richard Miles (UK). The asteroid is imaged using an unfiltered CCD camera attached to a 0.28m Schmidt–Cassegrain telescope and, simultaneously, wide-field V and I band images are taken with two smaller telescopes attached to the same mount. *Hipparcos* red-blue pairs of stars on images obtained by the latter are used to calibrate stars on the former along the track of the fast-moving NEO.

Remote observing

R. Lauryssen–Mitchell (Czech Republic) described the growing number of robotic telescopes which can be accessed via the internet by amateurs. These include Slooh Online Observatory (**http://www.slooh.com**), Bradford Robotic Telescope (**http://www.Telescope.org**), Faulkes Telescopes (**http://www.faulkes-telescope.com/**), RAS ('Remote Astronomical Society') Observatory (**http://ras-observatory.org**) and Red Mountain (a technology demonstrator rather than a real telescope). In general terms; an object is selected, a job request submitted, the images are taken at the appointed time and then the user downloads the images on to his or her own computer. Some telescopes give free time to amateurs whilst others charge by the hour.

Orbital dynamics

M. E. Sansaturio (Spain) spoke on '2004 MN4, an unexpected guest at Christmas 2004' and gave the meeting an overview of these events and the Sentry (JPL) and CLOMON 2 (NEODyS) close-approach monitoring systems. These are the only two automatically-updated risk-assessment systems in existence at the present time. To ensure consistency of impact predictions the two organisations consult one another if any object exceeds 2 on the Palermo Scale or 0 on the Torino Scale. In mid-December 2004 MN4 was 4 and +1.07 respectively with a possible Earth impact in 2029. The Asian tsunami on Boxing Day diverted media attention and by December 27 the potential danger had been ruled out.

A. Vitagliano (Italy) gave one of the most interesting presentations: '*Solex*, a powerful free software for orbital and ephemeris calculation and display'. The package actually includes two applications, *Solex* and *ExOrb* (previously *Findorb*). Using *Solex* one can search for asteroidal close approaches, impacts, conjunctions and occultations. ASTORB and ASTDyS libraries can be selected or positions of asteroids can be computed. If a single asteroid is selected its position on a given date and its orbital elements are displayed. *ExOrb* will generate orbital elements from astrometric data which can then be used by *Solex*. This software can be found at **http://main.chemistry.unina.it/~alvitagl/solex/**. In a second lecture this presenter demonstrated how *Solex* could be used to help determine the mass of an asteroid (15 Eunomia) by measuring the change in its orbital elements following a close approach to a more massive object (50278).

Impacts and impactors

C. Koebert (Austria) spoke on 'Meteorite impact cratering on Earth: Geological and bio-

MACE – continued from previous page

logical consequences'. Many solar system bodies show a history of impacts stretching back over 3 to 4 billion years. Crater chains may be evidence of impacts by comets that have previously broken up. Presence of an atmosphere and plate tectonics will reduce the number of craters formed by impacts and their longevity respectively. Discriminating between impact craters and other similar structures requires an understanding of the structures' morphology, geophysics, mineralogy and geodensity. Large impact craters on Earth are believed to have caused environmental changes leading to mass extinctions. Significant volcanic action can be triggered by impacts, dramatically changing the climate for millions of years after the initial event.

Vienna's Kuffner Observatory, location for the MACE meeting.

In addition to the lectures several visits had been arranged for participants. These included the Kuffner Observatory, Vienna University Observatory and one of the world's largest meteorite collections at the Vienna Natural History Museum. Most enjoyable was the evening meal at a typical Viennese Heuringen (restaurant), '10er Marie'.

Herb Raab (of *Astrometrica* fame) and his organising committee are to be congratulated on a very well organised and pleasant meeting.

Roger Dymock, *Director, Asteroids and Remote Planets Section*