TRANSIT

The May 2010 Newsletter of

Cleveland & Darlington Astronomical Society

NEXT MEETING

14 May 2010, *7.15 pm for a 7.30 pm start*

Wynyard Woodland Park Planetarium

Meteorites

Dr Victoria Pearson *Open University*

Contents

Editorial

Rod Cuff

This month there is a good mix of observing reports (all of them unusual in their different ways), suggested objects to see and projects to embark on, and general articles and reviews. Plenty to occupy you on those warm early summer evenings as you sit in your garden with a drink in your hand, missing the joy of being out in sub-zero temperatures trying to write your observing notes with a leaky pen and frozen fingers …

Many thanks again to all contributors. The copy deadline for the next issue is **Friday 28 May**.

Rod Cuff, info@cadas-astro.org.uk*,1 Farndale Drive, Guisborough TS14 8JD (01287 638154)*

Letters

Midweek meetings?

From Sue Barnes

Just to let you know I was reading the committee minutes you circulated and thought that mid-week meetings were an excellent idea. I have only just joined CaDAS and did find it quite daunting coming the first time – Ed kindly saved a seat for me and my son. It is always difficult when you don't know anyone, and unless you're good at mixing it can be off-putting staying for a chat after.

The formal lecture set-up also compounds this – that's not a criticism, as I do enjoy attending. I always get the impression that the questions at the end are asked by the people who are the most knowledgeable. Being able to share their knowledge and experience should be good for all.

Since I am new to astronomy, I enjoy the Beginner's Guides sections in the astronomy mags. I thought it might be an idea to pitch your mid-week meetings at different levels: beginners, intermediate etc. Possible suggested topics:

- Understanding your telescope, including focal length etc & choice of eyepieces
- Collimating your telescope
- Clear-night practical viewing on deep-sky objects (I know that's unreliable!)
- Workshop on sketching & photography

Best wishes – Sue

Buying and selling

From Mike Smith

How about having a space in *Transit* for selling items that other members might be interested in? I know there is something on the website about selling items but i have never seen anything advertised on there before.

Best regards – Mike

[Good idea, and in fact there used to be such a section a few years ago. Dear readers, please let me know details of any items you want to sell, with or without photos, and I'll advertise them in Transit*. I've started things off with an item on page 23. Similarly, if you're looking for something to buy or borrow and want to see if anyone can help, let me know that too. – Ed.]*

OBSERVATION REPORTS AND PLANNING

Skylights – May 2010

Rob Peeling

The Moon

6 May	14 May	20 May	27 May
Last Quarter	New Moon	First Quarter	Full Moon

In the first part of the month the Moon will be rising late or setting early. This is your last chance to get in some deep-sky observing before the persistent evening twilight prevents it for the summer months.

Planets

Venus continues its current apparition as the Evening Star. It is a brilliant white object low to the west. The sharp-sighted will be able to detect it with the naked eye as soon as the Sun sets.

Saturn is prominent to the south in the evening in Virgo beneath and to the east of Denebola, which marks the end of Leo's tail. Look out for the dark band of the shadow cast by the rings across the disk of the planet, and next to this a brighter band as the rings themselves cross the planet.

Mars is still in the sky but setting earlier in the evening. As the Earth pulls even further ahead in its orbit, Mars should be noticeably less bright because of its increasing distance. A telescope shows it to have a distinctly gibbous rather than full phase because of the angle at which the Sun's light illuminates it as seen from the position of the Earth.

If ever you happen to feel like getting up at about 4am after the middle of the May and have a good eastern horizon, then you could catch a first glimpse of this year's apparition of **Jupiter** as it rises. It is only about 3° from **Uranus**.

Deep sky

The constellations **Ursa Major** and **Canes Venatici** are more or less overhead in May, with **Boötes** well placed also and marked by bright Arcturus. This area of sky is rich in **Messier objects**.

The **Whirlpool Galaxy M51** and its interacting companion **NGC 5195** are a must-see pair. M51 is visible in binoculars from dark sites. From elsewhere it is easy to track down by star-hopping from Alkaid, the last star in the tail of the Big Dipper. I can usually see it in the finder.

It is probably the best time to see maximum detail in those old favourites, **M81** and **M82** – especially the dark lanes in M82. This is because they are nearly overhead. While in the area,

try to find **NGC 3077**, which is about 1° to the east and very slightly south of M81. It is actually a bright galaxy in its own right, but eclipsed by the Messier pair. It is part of the same system.

Out to the west from M81 & M82 is another bright galaxy that's worth a look on a dark night – **NGC 2403** in Camelopardalis. Find the group of three stars, π_1, π_2 and 2 Ursae Majoris well out to the west from Dubhe, the northern pointer. π_1 and 2 point towards 51 Cam, which is further west again. Scanning to the west of 51 Cam with low power should reveal NGC 2403, a fairly large object. Look out for the two stars apparently involved in the galaxy, which is marked in *Norton's* and the *Cambridge Double Star Atlas*. This galaxy was imaged by John McCue during his free session remotely using the Virtual Telescope at the Bellatrix Observatory near Rome.[1] I have had a couple of looks at it with my 12" Dob. I think it is big and bright enough for pretty much any telescope. It comes with Sir Patrick's recommendation as no. 7 in the Caldwell list.

NGC 2403, imaged by John McCue with the internet's Virtual Telescope[2]

Don't miss **M3**, the globular cluster in Canes Venatici. Find this by tracking with your finder roughly half the way along the line from Arcturus to Cor Coroli. It should show up as a fuzzy blob. Use high power to see this cluster resolve into thousands of stars.

[1] *[There's more on the Virtual Telescope in the article starting on page 5. – Ed.]*

[2] *John adds:* NGC2403 is a barred spiral galaxy in Camelopardalis, mag. 8.5, size 23 ×12 arcmins, distance 10 million light years. It is thought to be part of the famous M81 group of gravitationally bound galaxies.

An expedition to the North Pole

A continuing CaDAS project (started in the International Year of Astronomy 2009)
to collect observations, sketches, images and *any* kind of information about
any object with a J2000 declination ≥70 degrees.

Send your reports, lists, or whatever to Rod, Alex or Rob (contact info for all three is at www.cadas-astro.org.uk/contacts.html) or, if you prefer, bring them along to a CaDAS meeting.

Double stars in the NPE area

Alex Menarry

When Rob launched the North Pole Expedition (NPE) idea in *Transit* last year, he produced an initial list of double stars with declinations greater than 70°. I've recently taken a methodical look at the *Cambridge Double Star Atlas* and produced a more comprehensive list of every multiple star mapped in that atlas in the NPE area of interest. With Rob's kind agreement, here is that list – the starred ones were in the original set. The list is available as a spreadsheet if you'd like to adapt it for your own use.

North Pole Expedition doubles/multiples

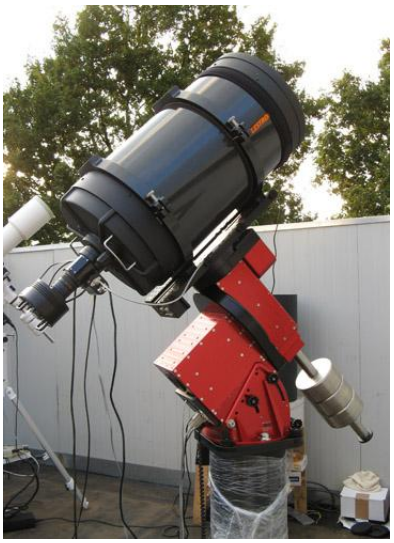
Designation	alt1	alt2	RA dec	separcsecs	mag1	mag2
Σ2	σCep		0009+7943	0.8	6.7	6.9
OΣΣ1			0014+7602	76	7.6	7.9
Σ13			0016+7657	0.9	7	7.1
OΣΣ5			0040+7652	116	7	8.7
HN122*	21Cas	YZCas	0046+7459	36.1	var	10.6
h2028			0117+7402	61	7.1	7.9
OΣ28*	OΣΣ14		0119+8052	130.9/0.8	7.2	8.7/7.8
Σ114			0124+7251	3.7	7.3	10.5
Σ170			0155+7613	3.2	7.4	8.2
β513			0202+7054	0.9	4.7	6.4
Σ185			0202+7530	1.3	6.7	8.2
Σ191			0203+7351	5.5	6.2	9.1
OΣ37			0210+8129	1.2	6.9	9.1
S405			0213+7942	56	6.5	7.1
Σ93*	Polaris	αUMi	0232+8916	19	2.1	9.1
Σ320			0306+7925	4.6	5.7	9.1
h2166	Cas		0308+7548	59/60/64	7.6	9.4/9.5/9.7
h2200*	γCam		0350+7120	106	4.6	8.5
h1139			0352+7030	47	7.5	9.6
Σ460			0410+8042	0.8	5.6	6.3
A841			0510+7541	48	7.3	9
Σ634			0523+7914	26	5.2	9.2
OΣ136			0628+7032	6	6	9.8

Σ973*			0704+7514	13	7.2	8.2
Σ1051			0727+7305	1.1/32	7.1	7.8/9.2
Σ1159			0806+7147	34	7.4	9.7
Σ1193*			0821+7224	43	6.2	9.7
OΣ188			0822+7449	10	6.5	9.8
Σ1362*			0938+7305	5	7	7.2
Σ1415*			1018+7104	16	6.7	7.3
Σ1590			1202+7041	5	7.5	10.5
Sh136*			1211+8143	71	6.2	8.3
Σ1625*			1216+8007	15	7.2	7.8
Σ1654			1232+7449	4	7.6	9.1
Σ1694			1249+8325	22	5.3	5.7
OΣ258			1254+8231	10	7.3	10.5
β799			1305+7302	1.2	6.5	8.5
h2682			1341+7651	26/44	6.7	9.0/10.3
h2733			1428+7542	59	4.3	9.9
Σ1915			1433+8556	2.5	7.1	10.1
Σ1972*	pi1UMi		1529+8027	32	6.6	7.3
OΣΣ143*			1605+7016	47	6.7	9.3
Ku1*	Hu917		1643+7731	2.9	6.1	9.4
Σ2241*	psiDra		1742+7209	30	4.6	5.6
Σ2308*	40/41Dra		1800+8000	19	5.7	6
Σ2302			1803+7547	6.1/23	66.9	9.4/9.9
Σ2452*			1854+7547	6	6.7	7.4
OΣ369			1907+7204	0.7	7.6	7.9
Σ2572			1915+8328	25	6.3	10
Σ2603*	epsilonDra		1948+7016	3	4	6.9
Σ2675*	kappaCep		2009+7743	7	4.4	8.3
75Dra*	β pm		2028+8125	197	5.5	6.7
OΣ436			2112+7619	12	7	10.5
Σ2796			2116+7836	26	7.4	9.6
Σ2806*	βCep	Alfirk	2129+7034	13	3.2	8.6
Σ2873			2158+8252	14	7	7.5
Σ2883			2211+7008	14	5.6	8.6
Σ2893			2213+7318	29	6.2	7.9
Σ2923*			2233+7022	10	6.3	9.2
OΣ481*			2244+7831	2.4	7.5	9.3
OΣ482			2248+8309	4	5	9.7
OΣ489	piCep		2308+7523	1.1	4.6	6.8
Σ3017			2328+7406	1.6	7.5	8.6

Observing with the Virtual Telescope

Rod Cuff

March was full of free lunches – well, free evening meals, I suppose. You probably know that these days there are a variety of websites offering live, controllable observation across the internet using remotely controlled telescopes. One of these is the Virtual Telescope, which celebrated Global Astronomy Month (GAM) in March by making half-hour observing slots available free using a 14" scope and attached CCD camera (*picture below from the VT website)*. Several CaDAS members – probably into double figures – took the opportunity to log in to the VT site when observations were going on, joined in the text-based chat, watched the images as they were downloaded from the CCD camera onto a live website, and listed to the delightful and very helpful Gianluca Masi, the owner of the observatory, as he or others operated the equipment.



Three of us took up the offer of a half-hour slot each, although bad weather (even in Italy!) meant my original slot had to be rescheduled, and Rob Peeling's had to be put off to some future time too. John McCue's slot followed immediately after mine, and you can see part of the results of his session illustrating Rob's article on page 4. All three of us were concentrating on recording objects within the NPE remit.

Since Gianluca may well offer free slots another time, and because in any case it's not expensive to book a slot on the VT and so you might be interested in trying it out sometime yourself, I'll briefly outline the operating process involved (the GAM booking process is described on the web page referenced above).

The first step is to download and install some free software (RealVNC) that will enable you to connect to the Italian system and operate it. Once you're ready to start your session, you put in a server name and one-off password that Gianluca will have supplied for this session, click OK, and then you have control of the remote desktop at the observatory. There's a downloadable manual that gives you the basics of what to do next. Basically you select your object either by name from various drop-down lists, or by typing it in explicitly, or by giving the RA and Dec, and then tell the telescope to slew there. You select an exposure (I was using 2 mins and 4 mins at various times), press OK and simply wait for your exposure to be taken. When that's done, you can move on to another object, and so on. Observatory staff will offer live audio and video help during your run.

My understanding is that they will have already set up dark frames of matching time-duration (so presumably it's best to stick to some standard exposure times) and flat frames, and that the software there will automatically process them all together so that instrument noise has been largely removed from the image that you subsequently download. The image file is in FITS format by default (there probably are options for other formats), in which case you'll need to have a graphics program that can handle such files (for instance, the free FITS Liberator will enable you to do subsequent processing in Photoshop). After that, the image is yours to play with and get into as good a form as you can.

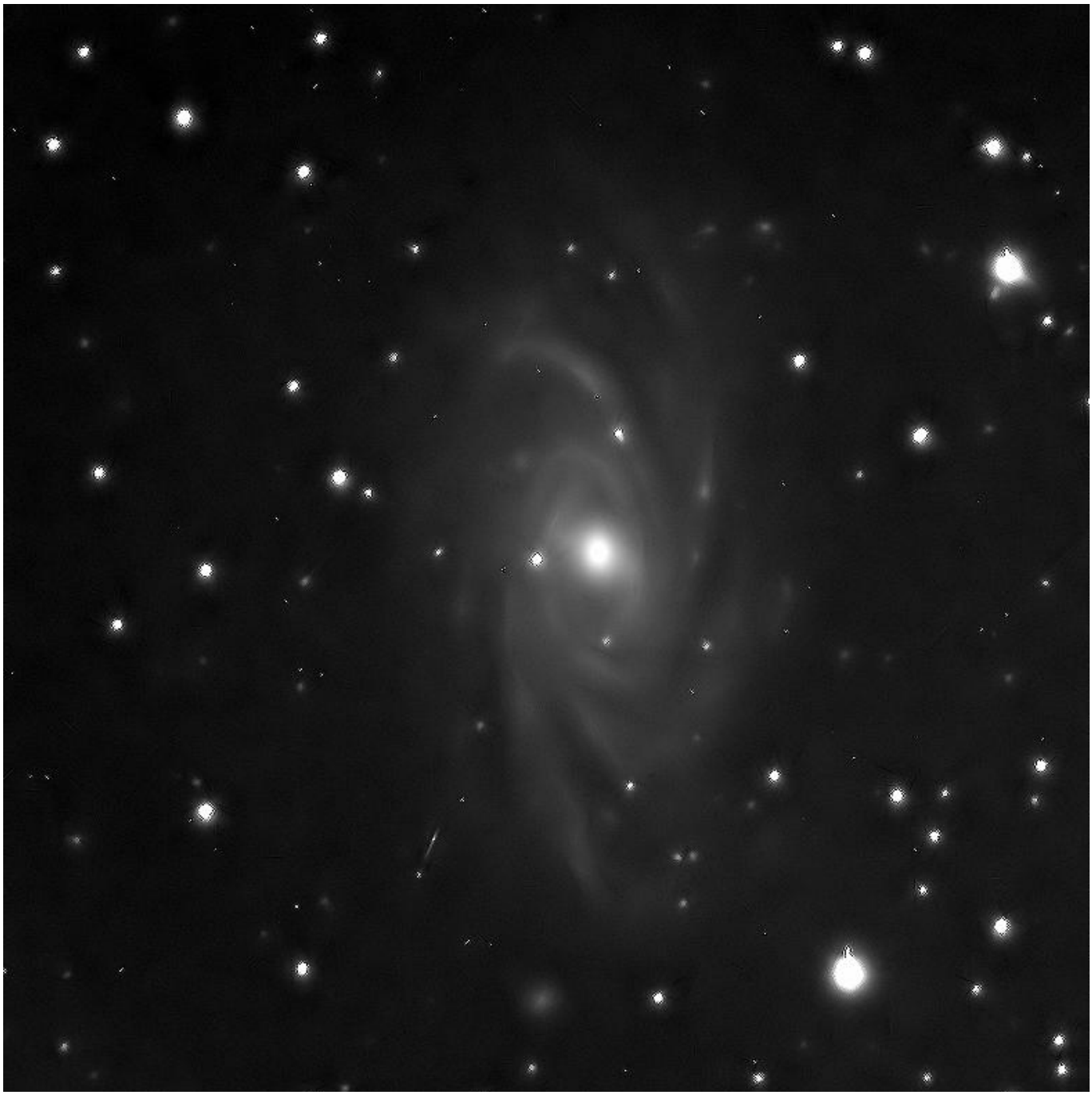
If you simply want to watch other people making observations and see what they're coming up with (it's open to anyone to drop into a VT session and join in the chat), just go to

http://virtualtelescope.bellatrixobservatory.org/webcam_wt.html and follow the Chat instructions in the top left corner.

Over the whole month, the VT attracted many thousands of followers for its real-time sessions, from over 100 countries. It ran an all-night Messier Marathon and an excellent tour of many sites on the Moon. Ours is the first generation ever to have had this kind of free access in domestic comfort to the glories of the sky through a decent-sized telescope (14") in real time while sharing the experience with others. It's quite something.

For my own session, I targeted various galaxies in the NPE area, taking those nearest to the North Celestial Pole that were shown in the *Cambridge Double Star Atlas* (which, as several people have remarked, is an excellent general star atlas in its own right). The principal objective was to capture NGC 2276 and NGC 2300 in the same frame, but I also had time for 2366 and 2655 as well. Here is some information (numerical data from SkyTools 2, description from various internet sources) on these, plus the images resulting from processing exposures for 2336 (2 mins) and 2276/2300 (4 mins) using Photoshop and Neat Image noise reduction (and reworked and improved from the versions I showed at the beginning of April's CaDAS meeting).

Id + type	***RA/Dec***	***Constellation & Size***	***Visual magnitude; Mean surface brightness***	***Notes***
NGC 2276, face-on spiral (Sc). Also Arp 25.	07h 27m 11s / +85° 45′ 19"	Cepheus 2.7″ × 2.3″	12.1; 22.7 mag/sq"	Perturbed, though apparently not by 2300, despite a common gas envelope. V. high star-formation rate
NGC 2300, elliptical (a). Also Arp 114.	07h 32m 20s / +85° 42′ 34"	Cepheus 3.4″ × 2.6″	12.1; 23.1 mag/sq"	Round though slightly elongated diffuse ball with bright stellar-looking core and much fainter irregular halo
NGC 2336, ringed barred spiral (SBbc)	07h 27m 04s / +80° 10′ 40"	Camelopardalis 6.3″ × 3.6″	11.1; 23.1 mag/sq"	Tight spiral arms contain many bursts of star-formation. Small bright core with large diffuse halo
PGC 213387, face-on spiral (Sa?)	07h 27m 16s / +80° 14′ 00"	Camelopardalis 24" × 19"	17.4; 23.8 mag/sq"	Unexpected bonus! Very faint, very far away – see image below. Spiral form seen clearly on internet images
NGC 2655, lenticular, nearly face-on (S0/Sa). Also Arp 225.	08h 55m 39s / +78° 13′ 25"	Camelopardalis 4.8″ × 3.2″	11.2; 22.8 mag/sq"	Unusually bright core, almost stellar nucleus. Asymmetric dust lanes may mean a recent merger with another galaxy



NGC 2336, with the much smaller image of PGC 213387 near bottom centre of the frame

NGC 2276 (lower right) and NGC 2300 (upper left)

Orion and the International Space Station

Keith Johnson & Rod Cuff

KJ: After checking with Heavens Above and confirming that ISS passes were going to be visible from my location on 8 March, I downloaded the TLE (two-line element) data from Celestrak and fed it into SkyMap Pro. This permits a very accurate plot of any fly-bys against the background stars.

After sifting through the dates and timings, I noticed that most data showed the ISS passing through Orion and that in fact two passes would be very close to M42, the Orion Nebula.

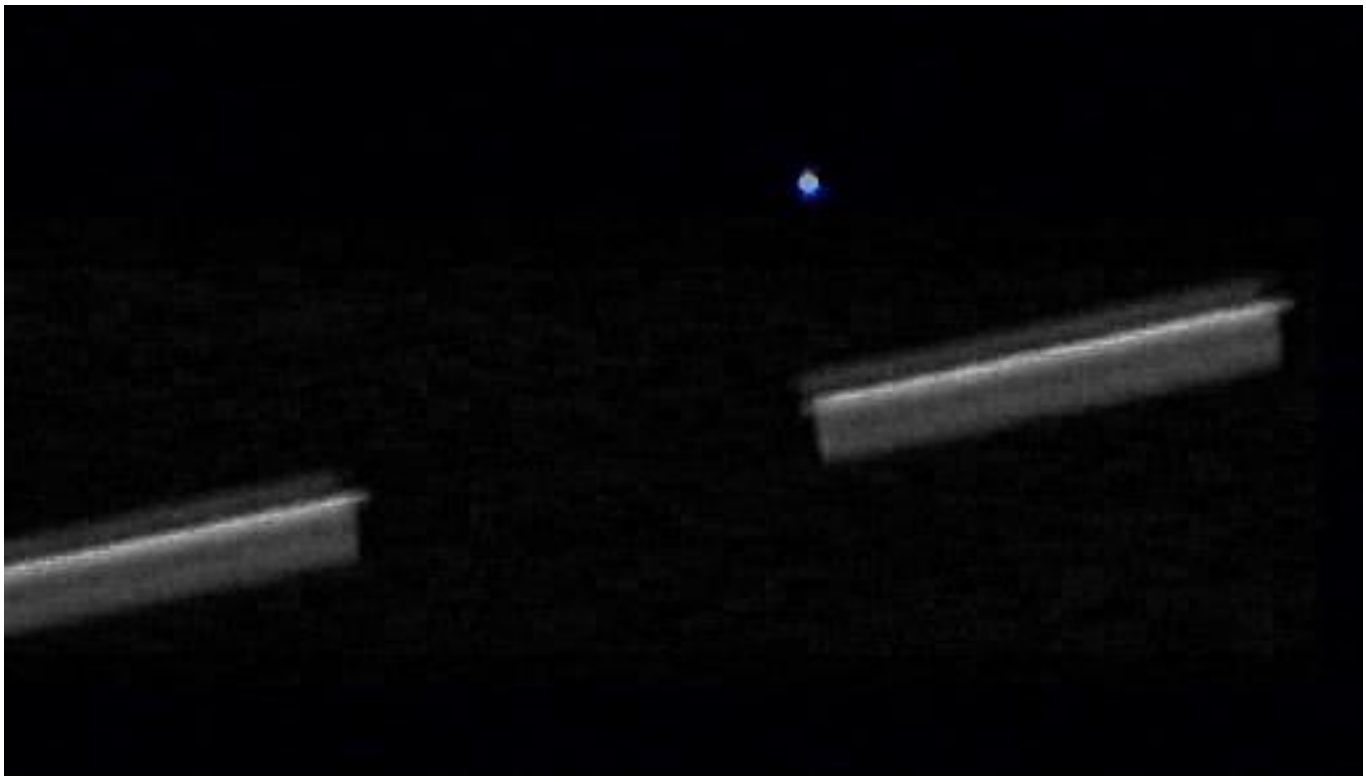
At 19:25 the ISS would be approaching from the west and passing close by M42 at 19:29. The weather forecast predicted clear skies clouding over at around 19:30, so at 18:00 I set up my EQ6 Pro mount, attached the Williams Optics ZS66 refractor and then the Canon 1000D DSLR. After using Sirius as the third star in my three-star alignment to achieve focus, I slewed to M42 and carried out a series of 30-second captures at IS0 400. With clouds approaching from the

north, I waited for what felt like a lifetime for the ISS to make its fly-by, and wondered what was going to pass by M42 first – clouds or the ISS? See below!

RNC: Earlier in the same day as Keith's activities above, 8 March, I'd received my usual daily emailed alert from CalSky about ISS passes visible from Guisborough. What was particularly interesting about this day was that from my location there was a strong chance that the ISS would occult Alnilam, the central star of Orion's Belt, at the wonderfully precise time of 18:43:43.66s. This was too good an opportunity to miss. It meant that I could use my regular Solar System photography set-up of an 8" Meade LX90, a ToUCam Pro 2 webcam, an infrared blocking filter and a laptop, prepare by centring and tracking Alnilam's focused image on the camera's chip (and hence the laptop window) and just wait for the ISS to cross the field of view (I hoped).

To improve the chances of capturing a few frames of ISS even if the 'occultation' turned out to be a near miss, I used a focal reducer to take the normal f/10 system to f/6.3, thus increasing the field of view. I guessed rather arbitrarily that 1/25 sec. would be a reasonable balance to capture detail yet reduce motion blur, and a few seconds before the ISS reached the Belt, I set the camera going at 15 fps.

Much yelling and jumping about signalled to my also-watching partner that I'd seen a flash of movement crossing the laptop screen, so I knew I'd captured *something*. Processing with Registax 5 a few minutes later showed that the ISS appeared in two frames – and that the CalSky prediction had been accurate to within a fraction of a second. I superimposed those frames, threw away the rest, and ended up with this:



Ah well, so much for using 1/25 sec exposures! Clearly for such a bright object, I could have reduced the exposure times and increased the frame rate – in theory the webcam will operate at up to 60 fps, though anything above 10 fps causes the downloaded images to be compressed (much as in a JPEG), thus losing detail. Exposures can be almost arbitrarily short. If I attempt an ISS shot in this way again, I'll try something like 40 fps to get more frames to contain an ISS image, and perhaps 1/200 sec exposures to get much less elongated images. I'll need to turn

the gain up enough to at least discern the bright star on the screen. My guess is that the results will be disappointing, but hey – experiment, experiment.

Some facts and comments about the picture:

- Helped by the useful information about image scale with various CCD cameras and f-ratios at http://www.zen32156.zen.co.uk/imageScale.htm, I deduced that the ISS missed occulting Alnilam by about 36 arcsec. Had the ISS been 50 metres to the north, the star would have been occulted.
- The ISS's image crossed the CCD chip in about 1/8 sec.
- With the eye of faith, you can discern the shapes of the space station's leading and trailing edges.
- Alnilam looks pretty good! I didn't alter the colour balance of the image at all, so the blueness is real. Its spectral type is B0 – a typical bright blue star.

I know, of course, that a better way of capturing the ISS's shape is to track it while videoing, and not to have the scope fixed on a star. That's on the astrophotographic agenda too.

A Venusian green flash

Rob Peeling

On 3 April, the BAA sent out an electronic bulletin (no. 00485), which included the following from Richard Baum, a former Director of the Mercury and Venus Section:

> *2010 March 1, 18:14–18:43hrs UT*
>
> *I had been watching the Sun set from the front bedroom window when my son Julian came into the room and almost immediately spotted Venus at 18:37hrs (first time this elongation), sparkling serenely in the frosty air a degree or so above the WSW horizon. I tracked it with 15×50 binoculars through the tangled branches of a distant tree as it arced down towards a clear bit of Clwyd hillside visible in a narrow gap between trees, houses and TV aerials. Its light when first seen was silvery and unsteady, but on descent changed successively to pale gold, yellow, amber then red-orange as the planet closed with the apparent horizon. The sky, a pale primrose hue, was cloud free along the horizon and we were able to watch the planet until it disappeared from sight – Julian with the naked eye, I with the binoculars.*
>
> *At 18:43hrs, now deep amber in hue, and on the verge of setting, Venus seemed to hesitate, splinter and change colour as it sat on the skyline but now converted to a sapphire that vanished as abruptly as it came. It all happened so suddenly that Julian sadly did not see the phenomenon. It took me quite by surprise; the green flash had not entered my thoughts. Nor did I expect ever to witness such a will o' the wisp phenomenon from an urban setting: no comparison with the exotic locales it is usually reported from. It was in every sense a most memorable occasion!*

[Subsequently I sent the following letter to the *BAA Journal*, which had asked for other reports of the same phenomenon.]

On 3 April 2010 I read the above bulletin with Richard Baum's observation report of a green flash from Venus as it set on 1 March. That evening the opportunity presented itself to see if I could see anything unusual as Venus set.

2010 April 3, 20:31 UT Location: Western edge of North Yorkshire Moors near Osmotherley. 54.3567°N, 1.2639°W, altitude 260m.

I watched Venus setting with 8×40 binoculars. Conditions weren't good, with a band of cloud close to the horizon. Venus was naked-eye, but Mercury wasn't, due to the cloud. Both Venus and Mercury were mostly a shade of deep orange-red. In the atmospheric disturbance both planets were fluttering between colours: through red, orange, yellow and whitish but never green. As Venus went behind the band of cloud it started to fade; then there was a sudden flash of much brighter and very definite green and with that it was gone. I am sure it was cloud Venus went behind because I was still able to very briefly glimpse Mercury as a more expected orange colour as it faded also.

I was very surprised to apparently repeat Richard Baum's observation at the first attempt, but the flash was certainly green.

For the observing location, USNO gives the time for Venus to set as 20:40 UT and azimuth 293°, and SkyMap Pro indicates an altitude of about 1° over the horizon at the time when I saw the flash.

2010 April 4, 20:07 UT Location: Eaglescliffe, Stockton-on-Tees. 54.5395°N, 1.3406°W, altitude 17m.

I decided to try using the roof ridge of nearby house as an artificial horizon. As Venus set behind the ridgeline of the roof, I watched through 8×40 binoculars. As the planet reached the roofline, I saw a very small rainbow replace the planetary image and which ranged from red at the bottom to green at the top. It descended and faded to lose red first and then green last as the planet set further. By adjusting my angle of view I was able to repeat this twice more. This did not look at all the same as the phenomenon seen the previous night, although the last colour seen was green.

Orion from Doe Park

Keith Johnson

Clear skies for the evening of Saturday 13 March were looking very promising, so I checked out a number of local campsites to try out our motor home for her 'maiden voyage'. With a clear view to the south, Doe Park, three miles out of Barnard Castle, looked suitable.

Using my TT320X Astrotrac and a Canon 1000D digital camera with a 50mm Pentax-type lens, I took this single five-minute exposure of Orion at ISO 800. Alas, very strong winds and the fact that I forgot my laptop mains adaptor prevented any further imaging!

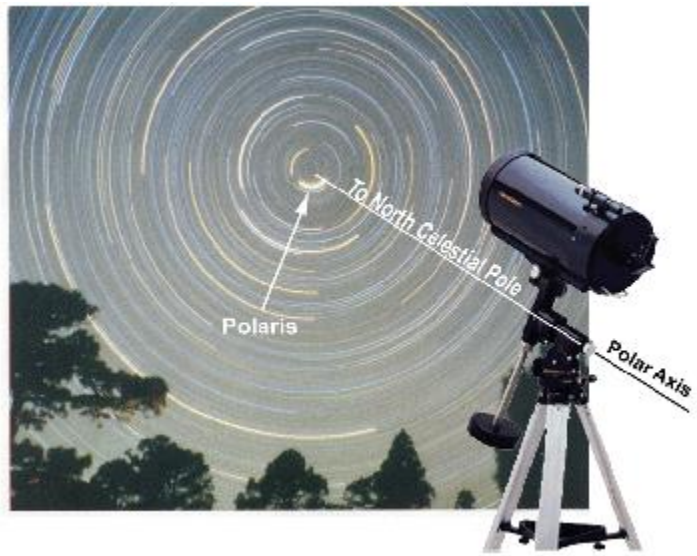
GENERAL ARTICLES

Using a German equatorial mount:

Part 1 – Description of the system

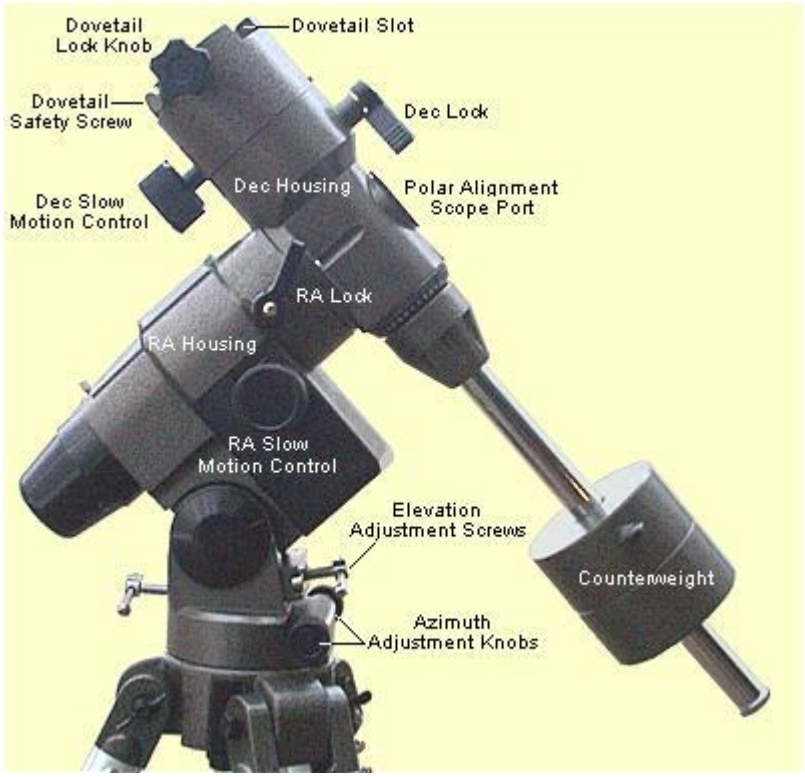
Alex Menarry

Before launching into a detailed discussion on how I have been setting up an EQ5 mount, also known as a German mount, it may be wise to describe briefly what the mount is and why it was designed. There are loads of websites to be found if one googles for 'equatorial mounts', and this article uses extracts, photos and diagrams from several of them.



If you point a telescope at the North Celestial Pole (NCP) and take a long-exposure photograph, the picture on the left above depicts a typical result. Note that Polaris is near to but not precisely at the NCP. Given the knowledge of a stellar object's RA and Dec, the EQ5/German mount is a device for pointing the telescope in the right direction by rotation about the RA and Declination axes, which are at right angles to one another. There are scales on each axis, to allow the RA and Dec to be set for the object you want to look at.

Here are all the detailed parts of the mount. I will be referring to most of these parts later in the article, so you may have to refer back to this picture occasionally.



By fitting motors to each drive (RA and Dec) and having a GoTo handset and computer, all the sweat can be taken out of directing the telescope to where you want to be. The expert star-hoppers in the Society will be horrified at this suggestion, but this is the system I'm describing and, until I can learn to star-hop with a good telescope, it gets me along!

I bought a cheap, Chinese-made EQ5 mount, which looked like the picture above. It didn't have the drives attached, so I bought an Eclipse GoToStar kit and fitted the motors myself. It now looks like this.

The telescope fits into the dovetail slot and the handset enables the object required to be entered, either by name or by RA and Dec. Press the OK button and off goes the telescope and finds the object you want. Wonderful! The descriptions and manuals are all on the Ioptron and Astronomica websites.

It gets even better. Given an RS232-to-USB cable and some free software from ASCOM, a click by the mouse on a computer screen showing the starry sky from SkyMapPro can be used to designate the required object and direct the telescope. Even more wonderful!

If it's all so wonderful, why am I writing these articles? Well, it's like this; the mount has to be set up so that in the 'park position' the RA axis and the telescope are pointing at the NCP. The computer in the GoToStar handset knows how to turn the motors the right number of rotations to arrive at a given RA and Dec from this position. If the telescope doesn't start from there, it doesn't arrive at the right place. In addition, the mechanical design and accuracy of manufacture of the mount determines the accuracy of movement as well. The method of telling the computer where it is in the sky is to use an alignment procedure, called One- or Two- or Three-star Alignment. You choose which you want to use, from the menu on the display. The method involves using the handset to go to a selected 'alignment star', ensure the star is in the centre of the field of view, then press OK and optionally repeat for another one or two stars. I always use three-star alignment, on the presumption that it gives the computer the most information and hence the best chance of knowing where it is.

And so Part 2 of this homily, 'Experiences in setting up', in next month's *Transit*, will describe some of my thoughts on how to use the system described above.

Honouring an icon

Neil Haggath

On 27 February, I had the honour to be in the same room as – though not to actually meet, as such – a man who can truly be described as an icon of modern science – Professor Stephen Hawking, no less!

Hawking is now 68, and has recently retired – which is itself no mean achievement, given that he was given three years to live at the age of 21.

The event, at the University of Cambridge, was organised by The Planetary Society, of which I've been a proud member for the last 24 years. For those who don't know, TPS is the world's biggest space advocacy group; founded in 1980 by the late Carl Sagan, it's based in the USA,

but has 130,000 members in about 70 countries. Funded entirely by its members' subscriptions and private donations, it has influenced policy decisions in NASA and the US Congress, and has funded experiments to be flown aboard planetary probes. It's currently building the world's first experimental solar sail spacecraft.

The purpose of the meeting in Cambridge was to honour Professor Hawking with the Society's Cosmos Award for Outstanding Public Presentation of Science. As you can probably guess from its title, the award was established in memory of Carl Sagan; it was presented by Ann Druyan, Sagan's widow – who was also his co-writer – and Neil deGrasse Tyson, Director of the Hayden Planetarium in New York, who are both members of the TPS Board of Directors.

Three other senior officials of The Planetary Society were also present – Louis Friedman, its Executive Director, who co-founded it with Sagan; its current President, Professor Jim Bell, who is one of the Principal Investigators for the Mars rovers, *Spirit* and *Opportunity* (I've met Jim once before, when he gave a public talk in Birmingham); and its Vice-President, Bill Nye. Bill is a well-known science populariser and TV presenter in the USA, known to viewers as 'Bill Nye the Science Guy'. Also present was the Astronomer Royal, Lord (Professor Sir Martin) Rees, a long-time colleague and friend of Hawking.

The afternoon began with the presentation of the award, and then Hawking gave a talk, via his famous speech synthesiser, on 'Why go into space?' (He has declined offers from various companies of their latest state-of-the-art speech synthesisers, because the 'voice' he has had for the last 25 years has become world-famous and instantly recognisable.) The talk was punctuated with his characteristic humour; for example, on the subject of alien life, he showed a cartoon in which a character says, 'Sometimes I think the best indication that there is intelligent life elsewhere in the Universe is the fact that none of it has bothered to come here!'

There followed a panel discussion in which the five TPS Board members and Lord Rees gave their varied opinions on the future of human spaceflight, followed by a session of audience questions. Jim Bell opened his piece by saying that he was especially honoured to be present at this occasion, because the two things that most inspired him to go into a career in science were… Sagan's *Cosmos* TV series and Hawking's book *A Brief History of Time*!

The event concluded with a reception, at which the Board members circulated and chatted to the rest of us. (It wasn't a public event but was open to TPS members only; there were a couple of hundred of us there.)

Interestingly, during the discussion a couple of the panellists had expressed similar sentiments to those that I expressed myself in my recent article about how 'Mankind's Pinnacle' is now all but forgotten, and the horrifying lack of historical knowledge among the younger generations. (Jim Bell told an anecdote that defied belief, about a student who asked him whether he was 'worried that the Chinese will beat us to the Moon'!) During the reception, I chatted to Lou Friedman on this theme; he didn't even seem particularly surprised when I told him about my younger friend who hadn't heard of Buzz Aldrin or Yuri Gagarin. It seems that things are no different in the States.

Overall, it was an interesting and most enjoyable occasion. While I didn't get to meet or speak to Professor Hawking – a lot of people wanted to, but sadly, conversation is a laborious process for him – simply being in the presence of such a remarkable man was privilege enough!

Astronomical coincidences

John Crowther

Because of the lighter evenings and the ice-free roads, more people arrived early for our April meeting. So there was more time for conversation both outside and inside the planetarium.

David Blenkinsop and Michael Roe talked to each other about the film *Destination Moon*, which they had seen on the Film Channel. I saw this in Whitby early in the 1950s. The space-suits were flimsy when compared with the real ones, then 20 years into the future. The lunar mountains on the set also looked too jagged. Did the rocket have wings and how was it powered? Were oxygen and hydrogen split from water? Did a member of the crew face being left behind because of a miscalculation? My memory of the story is now very sketchy.

Seeing the film 60 years before Michael and Dave isn't much of a coincidence, but hopefully my next two examples are more dramatic.

I'm presently rereading Jules Verne's book *Round the Moon*. This was a rewrite of *From the Earth to the Moon*. It's a mixture of correct and incorrect science and has much more detail than the first book.

Verne's projectile was made of aluminium one foot in thickness and was fitted with portholes. The story was written in 1863 during the American Civil War, so people were interested in artillery. The projectile was fired from a giant cannon called a Columbiad, which was sunk vertically into the ground at latitude 27° N in Florida. The Columbiad was 900 feet long and the 400,000 pounds of gun cotton was fired by electricity. Launched at 22:46:40 on 1 December, the projectile would reach the Moon 228,000 miles away four days later. The cost would be $5.5 million.

Despite the use of huge springs and collapsible sections filled with water, the traveller and their dog would have been flattened. Yet their descent to the Moon's surface was to be slowed by the use of rockets. The story is unbelievable for us, yet there were some details that came true 109 years later:

- the correct state, Florida
- a crew of three men (their dog 'Satellite' died, was ejected and became a satellite of the projectile)
- came down in the Atlantic, 2½ miles from the actual splashdown of 1969.

What follows comes from Robert A. W. Lowndes' introduction to the book.

> *We know today, of course, that a projectile fired from a cannon is not a feasible spaceship, but were there grounds for considering the story impossible in 1863? Actually, there were, and Verne was aware of them. He presents the facts in such a manner as to tip off the reader who might otherwise have been misled, but not in such a way as to spoil the illusion. Captain Nicholl presents the scientific objections correctly in the story; but for the sake of the story, these are argued down, and things come out as the members of the Gun Club believe they will.*
>
> *These first two novels were immediate successes, and now the path was clear; it was as if the many diverse threads in Verne's career had been gathered together – the desire to travel, the ambition to write, the fascination in reading of strange lands and natural science, the*

attraction of the theatre – into a single pattern. And Jules Verne had been guided to the right places and to the right people at the right times. His willingness to work hard, his excellent memory, and his never-still imagination were his own contribution.

Like his younger contemporary HG Wells, Jules Verne wrote with the nineteenth century's faith in science as a liberator and the key to a sane and happy world where ignorance, vice, poverty, disease, and the stupendous folly of war would become things of a forgotten past. And like Wells, Jules Verne came to realize that this faith was a chimera; although he died nearly a decade before the Great War shattered Wells' visions, Vern had realized that science alone is no answer to the human condition.

The third coincidence at first seems to be very impressive, but when it is closely looked at, it appears less so.

Jonathan Swift's book *Gulliver's Travels* was published in 1726. The stories in it were written more to ridicule the politicians of the time than to entertain children.

As the vastness of the universe has slowly been realized as well as the scarcity of life within it, any alien life forms have had to be placed further and further away from us. Swift's book was published two years before the birth of James Cook, so it was just possible to have strange life forms on South Sea islands because the Pacific then wasn't fully explored.

Like Jules Verne, he also had a flying island, which he called Laputa. It approaches the island where Gulliver was stranded, and he says, *'I took out my pocket perspective and could plainly discover numbers of people moving up and down the sides of it.'*

Then he meets up with them:

The Laputans spend the greatest part of their lives in observing celestial bodies, which they do by the assistance of glasses far excelling ours in goodness, for although their largest telescopes do not exceed three feet they magnify much more than those of aq hundred with us, and show the stars with greater clearness. This advantage hath enabled them to extend their discoveries much farther than our astronomers in Europe. They have made a catalogue of ten thousand fixed stars, whereas the largest of ours do not contain above one third part of that number. They have likewise discovered two lesser stars, or satellites, which revolve about Mars; whereof the innermost is distant from the centre of the primary planet exactly three of his diameters, and the outermost five; the former revolves in the space of ten hours, and the latter in twenty one and a half; so that the squares of their periodical times, are very near in the same proportion with the cubes of their distance from the centre of Mars; which evidently shews them to be governed by the same law of gravitation, that influences the other heavenly bodies.

In reality, Phobos has a sidereal period not of 10 hours but of 7 hours and 39 minutes; for Deimos it is not 21½ hours but 60 hours. Yet it's still a remarkable coincidence from 151 years before the actual discovery.ir

Swift was the Dean of Saint Paul's Cathedral and he would know the legends of the pagan gods. Mars, the blood-red God of War, had two attendants, Panic and Terror – Deimos and Phobos. (Have I got them in the right order?!). Similarly, Pluto and Charon have links with the old legends.

If I've made any mistakes in this article, please put me right, in the next *Transit*.

REVIEW

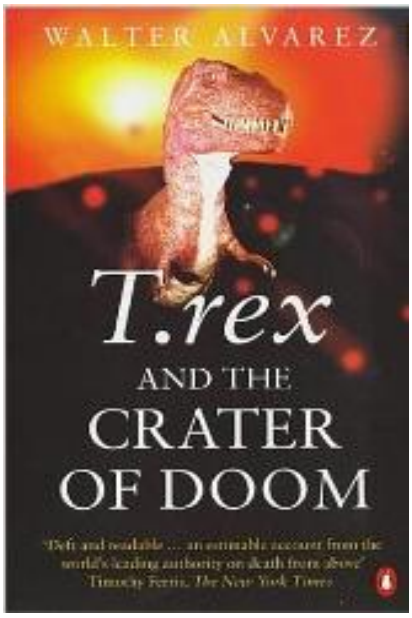
T. Rex and the Crater of Doom

By Walter Alvarez (1999). ISBN 978-0140276367 *paperback.*
£6.23 from Amazon-registered dealers (http://tinyurl.com/CaDAS10May)

reviewed by ***Andy Fleming***

Despite the title, this is not another Indiana Jones blockbuster, but an account of a 65-million-year-old cosmic detective story that ends with a theory, now accepted by most of the world's scientists, as to what caused the extinction of the dinosaurs, and with them seventy five per cent of the Earth's plant and animal species.

Like any riveting detective story, the first chapter provides a graphic portrayal of the crime scene, commencing in this case with an asteroid ten kilometres in diameter hurtling towards the Earth at forty thousand miles per hour. In less than a second the object hurtled through the Earth's atmosphere and buried itself forty to fifty kilometres deep in the planet's upper mantle at Chicxulub in the Yucatan Peninsula in Mexico. The described global catastrophe that followed, caused by the lava, ejector, massive tsunamis, global firestorms and associated atmospheric particulates and soot, is difficult to comprehend in scale. The melting of carboniferous limestone from the crater, one hundred kilometres wide, also led to a massive increase in atmospheric carbon dioxide, which had serious ramifications for the planet's climate.



Alvarez, his Nobel prize-winning physicist father, and a couple of other scientists, were the first to postulate that the KT, or Cretaceous–Tertiary, mass extinction event was caused by an asteroid impact, and most of the rest of the book takes us on a tour of geological sites from Italy to the USA and on to Mexico, collecting evidence in support of their hypothesis. The 'smoking gun' at the crime scene turns out to be the abundance of iridium in the worldwide sedimentary layer marking the boundary between the Cretaceous and Tertiary, below which fossils of the extinct species, including dinosaurs, are found, and above which they aren't.

Alvarez and his team soon realised the scale of the impact, and the hunt was then on to locate the gigantic crater. Confirmation of the impact site in the Yucatan came in 1978 when two geophysicists working for the Mexican state-owned oil company were undertaking an airborne magnetic survey. Supporting evidence near the crater included rising levels of iridium, gravity anomalies, shocked quartz and tektites. Isotopic dating confirmed the age of the crater at 65.5 million years – the same age as the worldwide Iridium layer.

This engaging book, of interest to both amateur astronomers and geologists alike, beautifully illustrates the scientific method and the development of a rigorously tested theory – in this case, that life on Earth is highly influenced by events in the cosmos. Alvarez gives due regard to his

dissenters, many of whom claimed that the dinosaurs were wiped out by climate change caused by carbon dioxide ejected from the Deccan traps.

One of the staggering facts portrayed in the book is that as late as 1975, many scientists thought that craters were caused by mysterious explosions in the Earth's mantle (just as they had initially thought the lunar craters were a result of vulcanism). The book documents the sea change in this opinion created in no small part by Gene and Carolyn Shoemaker and their work in identifying Meteor Crater in Arizona (*shown here)* as an asteroidal impact site.

Perhaps the pivotal event that really brought public and political attention to the cataclysmic devastation wrought by asteroid and cometary impacts was the pummelling of Jupiter's atmosphere by the comet Shoemaker–Levy 9 in July 1994 – and the largest fragments of this impactor were only two kilometres in diameter!

The book is a superb read, and a graphic scientific insight into a cosmic event that killed off the dinosaurs that had inhabited the Earth for 165 million years, an event that paved the way for the ascent of mammals, and ultimately us.

CaDAS NEWS

For sale

Black pop-up astronomical tent – a unique design that's quick to set up and folds down into its own zip-up bag 85 cm in diameter and about 7 cm thick. It has a domed-igloo shape, and its four side panels can be unzipped down to about chest height in order to point your telescope at the night sky while keeping a lot warmer than being outside. There is plenty of space inside to surround yourself with books, eyepieces laptop etc, and the fully opaque black walls serve to shield you from irritating light sources. There is room to sleep in it too. You can get an idea of what it looks like and of the process of putting up and taking down the tent on YouTube: http://www.youtube.com/watch?v=2SytJDh_oCI .

Sadly, the firm that made it (along with other specialist pop-up tents based on the same patent) appears to have gone out of business, so the tents are no longer available new. I bought mine at Astrofest a few years ago for around £210, but now offer it for sale, used only a couple of times, at £100 (or a reasonable nearby offer).

Rod Cuff (see contact details on page 2)

THE *TRANSIT* QUIZ

Answers to April's quiz

Q: What are the 'alpha' stars of these constellations?

1. Andromeda
2. Aquarius
3. Aquila
4. Aries
5. Cygnus
6. Hercules

Answers *(I sometimes think we should all learn Arabic …)*:

1. Alpheratz
2. Sadalmelik
3. Altair
4. Hamal
5. Deneb
6. Rasalgethi

Q: (Harder!) What constellations have these as their 'beta' stars?

7. Chaph
8. Scheat
9. Graffias
10. Zubenelchemale
11. Denebola
12. Kocab

Answers:

7. Cassiopeia
8. Pegasus
9. Scorpius
10. Libra
11. Leo
12. Ursa Minor

May's quiz

Fill in the gaps.

1. The absolute magnitude is the apparent magnitude that a star would have if it were observed from a standard distance of ———.
2. The apparent magnitude of the Sun is about ———.
3. The sidereal day is the mean interval between successive culminations (transits of the meridian) of the same star, and to the nearest second is ———.
4. The Earth's escape velocity, to the nearest km/sec, is ———.
5. ——— is the brightest star in our skies, and ——— is the least bright first-magnitude star.
6. Of all the 21 first-magnitude stars, ——— has the brightest absolute magnitude, and ——— the least.
7. The Earth/Moon system, or indeed any two-body system, has ——— Lagrangian points.
8. The first star to be discovered to vary in a periodic manner was ———.
9. Because of precession, the celestial pole describes a complete circle around the pole of the ecliptic in about ——— years.
10. The first quasar to be identified, and optically the brightest, is designated as ——— in Virgo.

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Or Contact aileenmalone@walkwithdestiny.com 01236 766970

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