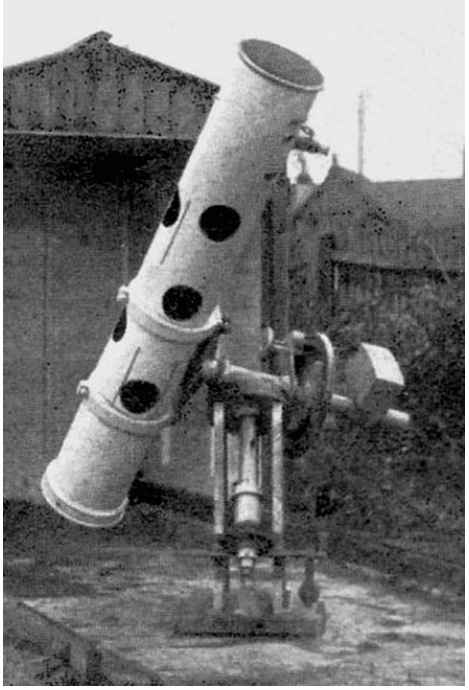
BAA

I & I News

New Series No. 15 | Newsletter of the Instruments and Imaging Section | 27 January 2014

This issue of *I&I News* presents the old and the new, each with its own attributes: from a Victorian 'battleship' for visual observations, to an array of cameras, to a refurbished Schmidt–Cassegrain for high-resolution colour imaging, and an historical note on some of the world's largest instruments. Also included in this issue is a short story by a former student of science who often interrupted lectures to talk about sociology. I recommend that you read this story while alone in your observatory at night.

Bob Marriott, *Director*

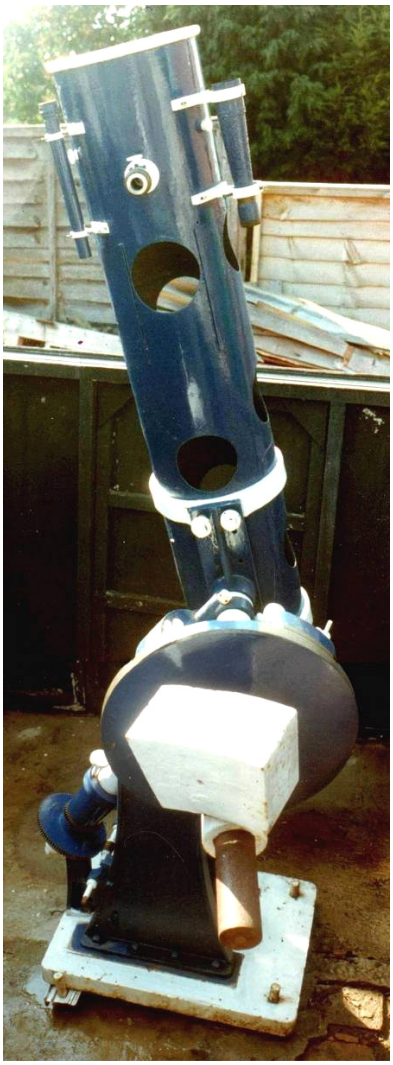


Ipswich, 1934

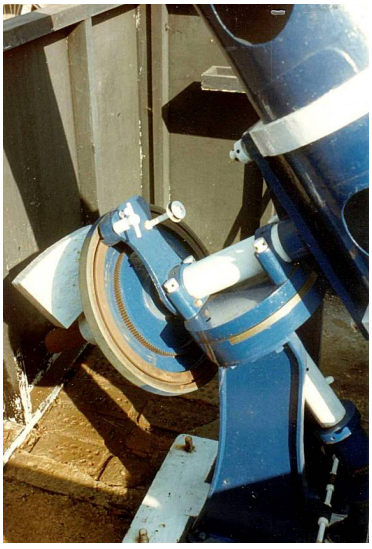
A With–Browning reflector

Bob Marriott

BAA instrument no. 50 is a 10-inch f/7.2 With–Browning reflector. The mirror, made by George Henry With of Hereford, is inscribed and dated: 'Withus Herefordensis, me ad astra investiganda, A.D. 1875', while the rest of the instrument was produced at the works of John Browning, at 63 Strand, London. It was presented to the Association by A. G. Batley in 1934, and was immediately placed on loan to Edward H. Collinson, who had joined the Association in 1920. During the 1920s Collinson was a pioneer of meteor photography, and later turned to variable-star and planetary observation. He was President from 1952 to 1954, Director of the Mars Section from 1956 to 1979, and recipient of the Steavenson Award in 1986. The instrument remained with him for fifty-three years, and in November 1987 I collected it from him and brought it home to Northampton. It was then stripped down and refurbished, and has been used ever since. The holes in the tube minimise tube currents by allowing the escape of cold, dense air which, when heat is radiated from the tube, would otherwise fall to the bottom and produce currents. (See W. H. Steavenson's article on seeing, in *I&I News*, New Series No. 1, 26 September 2011.)



Playford, Suffolk, November 1987



Meridian Observatory Louth

Michael Wood

I first joined the BAA as a solitary schoolboy in the late 1940s – travelling alone by train from north Lincolnshire to Burlington House for meetings. Subsequent work as a topographic surveyor, military engineer, and ultimately a UN-rostered adviser meant that UK activity (and BAA membership, now revived) was for some years forestalled by the great 'abroad', though I did see a share of the southern sky, including objects not visible in northern climes. However, I am now semi-retired, back in north-east Lincolnshire, and as busy as ever, seeking a permanent home for a purpose-built observatory *on the meridian*. I began astronomical and meteorological photography in the early 1950s with an Ensign-Selfix 16/20.II and a 'DoubleWood' hand-and-stand interchangeable-lens 9 x 6-cm roll-film/cut-film/plate camera, and worked through the years (and cameras) until ultimately using the full Minolta SR series (with a very useful mirror lock-up and a recording data-back). The cameras are still in occasional use, but are considerably helped now by three makes and models of digital camera, starting with an admirable Minolta digicam augmented by an Olympus E-300, a Nikon D-70s, and two Casio QV-2800UXs with up to 300-mm optical zoom. One is used as a panoramic all-sky camera augmented by a Nikon ER-1 fish-eyed Nikon Coolpix 990. As Meridian Observatory Louth and its Scartho Field Outstation are essentially peripatetic 'meteo' (in the Aristotelian sense) observatory facilities I am geared to portable operations, though I do possess a clock-driven EQ5-mounted 6-inch f/13 refractor and a 6-inch astrograph. Deep-sky field-work is easiest performed *ad hoc* with a 4-inch f/5 refractor (EQ2 and altazimuth mount), and mobile planetary work with a 4-inch f/10 refractor mounted similarly.

The first two photographs show the alternative configurations of the most convenient mobile set-up with a 500-mm f/5 Maksutov–Cassegrain astrograph augmenting the action in wide-field exploration with a Minolta XD-5 data-back. The second two photographs show the two Casios.

The next photographs shows the Olympus E-300 partnering the Synta Maksutov–Cassegrain on a tripod for supporting 'kerbside' tabletop astronomy on the terraces of an hospitable pub, a cricket club, and a services club (the camera is interchangeable with all eyepiece set-ups).

We have two Autostar-driven Meade ETX-70s for such work, with record-photography, but currently both are suffering from less than delicate handling of the focus mechanism by beginners.

The aerial photograph shows Scartho Field, from where we can obtain views north, south, east, and west, in the face of enormously bad microparticulate, atmospheric, and light pollution!

Meridian Observatory Louth

W 00° 00' 00" E, 53° 22' N

Scartho Field Outstation

W 00° 04' 00", 53° 34' N

Scartho, Lincolnshire meridian_obsvtry_louth@mail.com

Remounting an old 10-inch Meade SCT

Kevin Kilburn

In *I&I News* New Series No. 5 (9 February 2012) I described the tri-axis balancing of an old 10-inch LX200 SCT loaned to me by Dame Kathleen Ollerenshaw (who, in October 2013, was 101). The telescope has served me quite well for a few years for my interest in lunar and planetary imaging, though I never really obtained the results I had hoped for with a new Imaging Source DBK21618AU colour video camera bought in February 2012. I now know that this was largely due to poor seeing in the shallow valley in New Mills, where I then lived, with cool night air draining downhill from the much higher ground of the 2,000-foot Kinder Scout, less than four miles away in the High Peak of north-west Derbyshire. In August 2012 I moved 25 miles south-west to the Staffordshire Moorlands, to the top of a hill 220 metres above sea level, where the seeing is noticeably better, and I looked forward to rebuilding the moveable telescope pier and recommencing lunar imaging in 2013.

The telescope was remounted on a massive moveable pier so that it could be run out of a small annex in a garden workshop which I had inherited when I bought the bungalow at Folly Fields, Cheddleton. The pier is a welded tubular steel frame, heavily cross-braced. It is sandwiched, top and bottom, by hexagonal, concrete paving slabs (18 inches across the flats) held together by 10-mm stainless steel threaded rod passing through the tubular frame. A three-legged base support, with one fixed and two swivelling 95-mm rubber-tyred castor wheels, was fabricated from 70-mm square uPVC downspout, and the entire base was filled with concrete to act as ballast for the original heavy steel equatorial wedge and telescope. (I like using concrete and steel in telescope mountings.) The total weight is about 135 kg. The idea, tried and tested at my New Mills setup, was to run the pier and telescope out of the annex, ram the fixed castor into a V-shaped docking device set into the pavement, and then 'shimmy' the pier until a steel pin drops into a locating hole in the pavement. It worked – the mounting repeatedly aligned within ±0°.25. Finer adjustment was to be made with the equatorial head, adjustable in azimuth and polar-axis tilt.

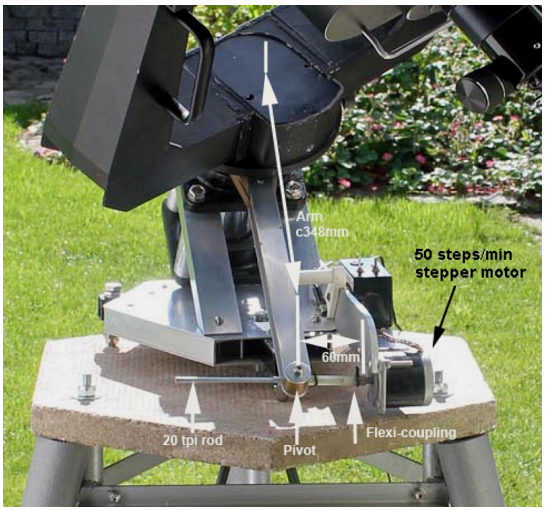
Then, disaster: the Meade RA drive that I had used for two years even after 'frying' the handset, failed to work. A local telescope dealer could not fix it, and my son, who is a senior engineer specializing in electronics with BAe Systems and Eurofighter, pronounced total failure of the Meade motor control circuits. The only option was to start again and remount the telescope and its original Meade fork onto another equatorial head. A new heavy-duty mounting capable of carrying the telescope – perhaps an HEQ6 Pro – was unaffordable, but fortunately I had something else available.

Twenty years ago, several members of Manchester Astronomical Society constructed stepper-motor-driven Scotch, or barn door, tangent-arm mountings. Most of these were designed to be lightweight and portable, but I wanted a heavy-duty version. This and the stepper-motor drive circuitry are described on the following web pages:

http://www.manastro.org/projects/scotch.htm
http://www.manastro.org/projects/tangent.htm

It must be pointed out that the circuitry is out of date and that at least one of the components is now obsolete, but I am assured that replacements, or a workaround, are available. My heavy-duty equatorial head enjoyed very good feedback on the web for many years. So, this is what I used to remount the big telescope.

The equatorial head is built around two cast iron pillow blocks carrying self-centring bearings and separated by short lengths of 25-mm OD aluminium tube. The whole, roughly cubical, unit is held together under tension with 10-mm stainless threaded rod to produce a rigid block supported on a truncated triangular base. Aluminium channel is trapped onto the block's upper edge to form two stiff bracing arms that bolt to the top of the triangular fabrication made from 4-mm aluminium plate and channel that holds the bearing block tilted at about the correct latitude for Manchester (53°.5). This braced aluminium structure originally sat on the top of a tripod, but I have modified it



with a 25-mm square steel section 'T' that now supports the equatorial head on the new telescope pier, with stainless steel adjusting screws to refine the equatorial alignment. The equatorial head is bolted to the top of the pier with a 10-mm stainless steel bolt that allows azimuthal adjustment. This is facilitated with a green laser (not shown in the photographs) that allows azimuthal realignment to better than 1°.1 against a target set on the far side of the garden, about 9 metres away.

The Meade fork was dismantled and the centre section modified by MAS member Colin Harrison, with machined parts to fit it to the top of a corrosion-resistant 30-mm OD steel tube, hard chromed by another friend, Mike Oates. This polar axis is more

2013 November 12, 1938 UT
HDR toned, auto-levelled, slight gamma correction

than twice the length of the original Meade polar axis, and offers far better stability.

The base of the fork traps the tangent arm against a friction disc on the polar axis. This can be locked to ensure RA driving, but in practice this has not been necessary, as the weight of the telescope ensures that the tangent arm is driven by the stepper motor. Manual slewing in RA is thus simple and easy, and then the drive takes over.

The 50 steps/minute motor is driven by a 12V rechargeable battery (on the photographs, shown on the ballast block). The fixed motor drives a ¼-inch, 20 threads-per-inch Whitworth-threaded steel rod attached to the motor by a flexible coupling to accommodate bending as the hour angle increases. This was originally a short piece of thick-wall silicone rubber tubing (as shown in the photograph), but has since been replaced by a universal joint of the type sold for radio-controlled model cars. This more solid, glass-reinforced nylon coupling stops radial bouncing when manually slewing the telescope. The threaded rod passes through a brass pivot in the tangent arm and pushes the arm clockwise to provide drive in RA. Dissimilar metals – steel and brass – minimise sticking, but the steel rod is lightly greased.

The stepper motor control box was designed and fabricated by Ray Grover, a retired technical manager from Philips, nearly twenty years ago. As stated previously, some of the components are no longer available, but the circuit could be redesigned using modern components. It provides a very solid 50 steps/minute to produce a fairly accurate RA drive, but can be reversed to give x8 speed to fast rewind the threaded rod and automatically stop against a stalk-mounted button. This type of straight tangent-arm drive (as compared with a curved radial drive) suffers from tangent error which in my case has been mitigated by the adjustable length of the arm – nominally 348 mm – to provide a slightly slow drive during the first fifteen minutes followed by an increasingly fast drive. In practice, the drive readily keeps objects in a x125 field of view for well over 30–40 minutes before it needs rewinding. This is ample for high-resolution lunar video imaging, and is more accurate (albeit less smooth) than the original Meade drive without periodic error correction.

Since remounting was completed in November 2013, weather conditions have prevented high-resolution lunar colour imaging, although prime-focus imaging, via camera control from the laptop computer within the annex, for the exploration of lunar colour with a DSLR, has been very successful. It has also been desirable, though not absolutely necessary, to replace the rubber-tyred wheels with solid 100-mm plastic wheels (90 kg maximum individual loading) to minimise top-heavy vibration. In hindsight, solid steel wheels would have been preferable to castors from the outset. It has also been desirable to attach a polar-axis counterweight to offset the back-heavy telescope now on its lighter aluminium equatorial head, to improve the overall balance.

Cheddleton, Staffordshire kevinkilburn@sky.com

Grubb, Parsons, Dreyer, and the Royal Navy

Bob Marriott

More than 200 years after the founding of the Royal Observatory at Greenwich in 1675 the advance of technology had negated some of the older methods of navigation, yet the work and achievements of the Earls of Rosse (the Parsons), the Dreyers, and Grubb continued to maintain the relationships of astronomy, optics, engineering, naval architecture, ballistics, and gunnery.

In 1846, William Parsons, third Earl of Rosse (1800–1867), completed the construction of a 72-inch aperture telescope – the largest in the world at that time, and justifiably known as the 'Leviathan of Parsonstown'. (Parsonstown, in County Offaly, is now called Birr.) During the 1870s the fourth Earl, Lawrence Parsons, continued with astronomical work, though to a lesser extent, and employed the Danish astronomer John Louis Emil Dreyer (1852–1926) (who many years later would be appointed Director of Armagh Observatory). The fourth Earl's youngest brother, Charles Parsons (1854–1931), became a naval architect, and invented the steam turbine in the form in which it is still designed today. Here began a network of science, naval affairs, and family connections.

In 1895, Alfred von Tirpitz was appointed Chief of Staff of the German High Command: 'In my view, in the coming century Germany will rapidly decline from her position as a great power unless we begin to develop our maritime interests energetically, systematically, and without delay ... The military situation against England demands battleships in as great a number as possible.' Thus began the Naval Race, and the appearance of a new type of British battleship – the first of them being *Dreadnought*. Laid down in 1905, *Dreadnought* was powered by steam turbines designed by Charles Parsons, and during its first trials in 1907 the gunnery officer was Frederic Charles Dreyer (1878–1956) – J. L. E. Dreyer's son, born in Parsonstown.

Similar connections included Charles J. Corbett, a wealthy architect and property developer who around 1870 acquired Williams Huggins' 8-inch Clark/Cooke refractor. His son was Sir Julian Stafford Corbett (1854–1922) – lawyer, naval historian, geostrategist, and close friend of Admiral Jackie Fisher, to whom he was a confidant and adviser during the Naval Race leading up to the First World War.

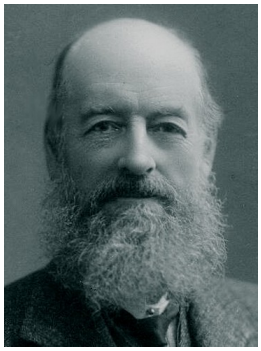
The Grubb Telescope Company was founded by Thomas Grubb (1800–1878) in Dublin in 1833. His son (later Sir) Howard Grubb (1844–1931) joined the company in 1864, and headed it from 1878 until 1925, when it was acquired by Sir Charles Parsons and renamed Grubb Parsons. In addition to these various and longstanding relationships, there can be seen a common theme in the heavy-duty, thick-set design of Grubb and Grubb Parsons telescopes and the blunt lines of *Dreadnought* and other ships of the Royal Navy, even down to the colour: 'battleship grey' is more a pale olive-grey – the colour favoured by Grubb Parsons.

Over many decades, Grubb Parsons produced numerous instruments small and large, such as the Isaac Newton Telescope, the William Herschel Telescope, the United Kingdom Infrared Telescope, and many other instruments for observatories in Britain, Europe, Australia, Egypt, Japan, Russia, and the USA; but perhaps the most magnificent production as the company approached its unforeseen demise (it was liquidated around 1980) is the 150-inch Anglo-Australian Telescope of the Australian Astronomical Observatory at Siding Spring, New South Wales – one of the world's foremost research establishments.

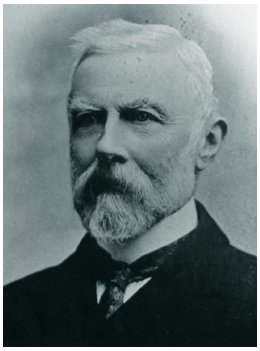
For many years the Chief Optician at Grubb Parsons, in charge of production of many of these instruments, was David Sinden (1932–2005), who, though by profession a highly skilled optical worker, was also an amateur astronomer and a member of the British Astronomical Association for fifty-six years. He has said of Sir Howard Grubb: 'He was a master engineer, he was one of the great old English engineers, he was a Rembrandt of the lens-making age, he was a miraculous and skilful man – a craftsman in the very best tradition.'

The accompanying photographs include some of the achievements of Grubb Parsons, showing the similarity in design and construction of astronomical instruments and naval armaments. *I&I News* New Series No. 5 (9 February 2012) includes an article by Len Clucas, who began work as an apprentice at Grubb Parsons in 1953 and is still manufacturing telescopes in his own workshop.

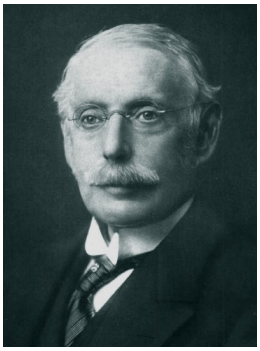
William Parsons



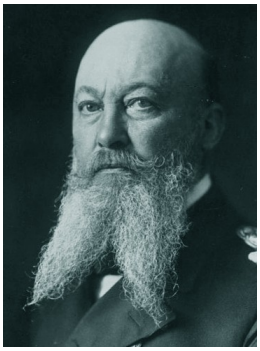
Lawrence Parsons



John Louis Emil Dreyer



Charles Parsons



Alfred von Tirpitz

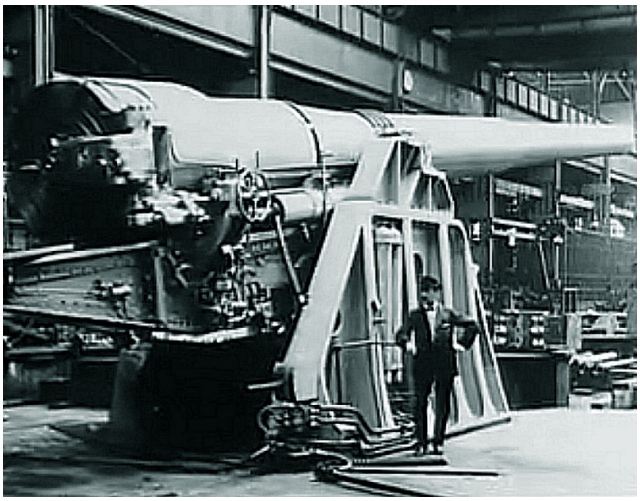
Frederic Charles Dreyer

Julian Stafford Corbett

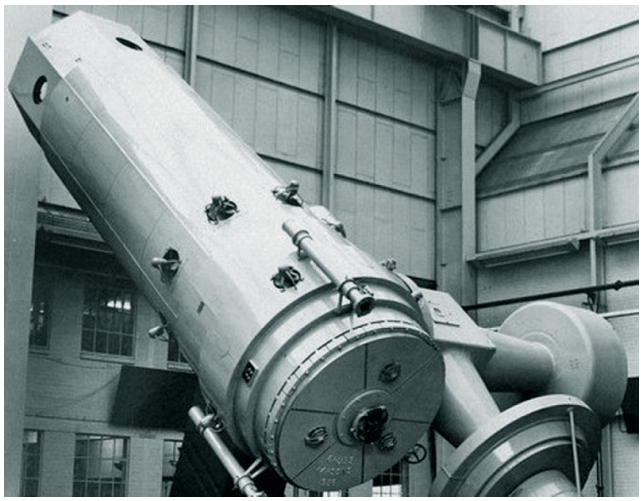
Jackie Fisher

Howard Grubb

David Sinden



One of the ten 12-inch guns for *Dreadnought*.



The Grubb Parsons 72-inch reflector for St Michel Observatory.

A steam turbine at Birr Castle, Ireland.

The 150-inch Anglo-Australian Telescope.

Len Clucas's 6-inch f/15 folded refractor, and *Belfast* on the Thames.

In the Avu Observatory

H. G. Wells

Pall Mall Budget, 1894

The observatory at Avu, in Borneo, stands on the spur of the mountain. To the north rises the old crater, black at night against the unfathomable blue of the sky. From the little circular building, with its mushroom dome, the slopes plunge steeply downward into the black mysteries of the tropical forest beneath. The little house in which the observer and his assistant live is about fifty yards from the observatory, and beyond this are the huts of their native attendants.

Thaddy, the chief observer, was down with a slight fever. His assistant, Woodhouse, paused for a moment in silent contemplation of the tropical night before commencing his solitary vigil. The night was very still. Now and then voices and laughter came from the native huts, or the cry of some strange animal was heard from the midst of the mystery of the forest. Nocturnal insects appeared in ghostly fashion out of the darkness, and fluttered round his light. He thought, perhaps, of all the possibilities of discovery that still lay in the black tangle beneath him; for to the naturalist the virgin forests of Borneo are still a wonderland full of strange questions and half-suspected discoveries. Woodhouse carried a small lantern in his hand, and its yellow glow contrasted vividly with the infinite series of tints between lavender-blue and black in which the landscape was painted. His hands and face were smeared with ointment against the attacks of the mosquitoes.

Even in these days of celestial photography, work done in a purely temporary erection, and with only the most primitive appliances in addition to the telescope, still involves a very large amount of cramped and motionless watching. He sighed as he thought of the physical fatigues before him, stretched himself, and entered the observatory.

The reader is probably familiar with the structure of an ordinary astronomical observatory. The building is usually cylindrical in shape, with a very light hemispherical roof capable of being turned round from the interior. The telescope is supported upon a stone pillar in the centre, and a clockwork arrangement compensates for the earth's rotation, and allows a star once found to be continuously observed. Besides this, there is a compact tracery of wheels and screws about its point of support, by which the astronomer adjusts it. There is, of course, a slit in the movable roof which follows the eye of the telescope in its survey of the heavens. The observer sits or lies on a sloping wooden arrangement, which he can wheel to any part of the observatory as the position of the telescope may require. Within it is advisable to have things as dark as possible, in order to enhance the brilliance of the stars observed.

The lantern flared as Woodhouse entered his circular den, and the general darkness fled into black shadows behind the big machine, from which it presently seemed to creep back over the whole place again as the light waned. The slit was a profound transparent blue, in which six stars shone with tropical brilliance, and their light lay, a pallid gleam, along the black tube of the instrument. Woodhouse shifted the roof, and then proceeding to the telescope, turned first one wheel and then another, the great cylinder slowly swinging into a new position. Then he glanced through the finder, the little companion telescope, moved the roof a little more, made some further adjustments, and set the clockwork in motion. He took off his jacket, for the night was very hot, and pushed into position the uncomfortable seat to which he was condemned for the next four hours. Then with a sigh he resigned himself to his watch upon the mysteries of space.

There was no sound now in the observatory, and the lantern waned steadily. Outside there was the occasional cry of some animal in alarm or pain, or calling to its mate, and the intermittent sounds of the Malay and Dyak servants. Presently one of the men began a queer chanting song, in which the others joined at intervals. After this it would seem that they turned in for the night, for no further sound came from their direction, and the whispering stillness became more and more profound.

The clockwork ticked steadily. The shrill hum of a mosquito explored the place and grew shriller in indignation at Woodhouse's ointment. Then the lantern went out and all the observatory was black.

Woodhouse shifted his position presently, when the slow movement of the telescope had carried it beyond the limits of his comfort. He was watching a little group of stars in the Milky Way, in one of which his chief had seen or fancied a remarkable colour variability. It was not a part of the regular work for which the establishment existed, and for that reason perhaps Woodhouse was deeply interested. He must have forgotten things terrestrial. All his attention was concentrated upon the great blue circle of the telescope field – a circle powdered, so it seemed, with an innumerable multitude of stars, and all luminous against the blackness of its setting. As he watched he seemed to himself to become incorporeal, as if he too were floating in the ether of space. Infinitely remote was the faint red spot he was observing.

Suddenly the stars were blotted out. A flash of blackness passed, and they were visible again. 'Queer,' said Woodhouse. 'Must have been a bird.' The thing happened again, and immediately after the great tube shivered as though it had been struck. Then the dome of the observatory resounded with a series of thundering blows. The stars seemed to sweep aside as the telescope – which had been unclamped – swung round and away from the slit in the roof. 'Great Scott!' cried Woodhouse. 'What's this?' Some huge vague black shape, with a flapping something like a wing, seemed to be struggling in the aperture of the roof. In another moment the slit was clear again, and the luminous haze of the Milky Way shone warm and bright. The interior of the roof was perfectly black, and only a scraping sound marked the whereabouts of the unknown creature.

Woodhouse had scrambled from the seat to his feet. He was trembling violently and in a perspiration with the suddenness of the occurrence. Was the thing, whatever it was, inside or out? It was big, whatever else it might be. Something shot across the skylight, and the telescope swayed. He started violently and put his arm up. It was in the observatory, then, with him. It was clinging to the roof apparently. What the devil was it? Could it see him?

He stood for perhaps a minute in a state of stupefaction. The beast, whatever it was, clawed at the interior of the dome, and then something flapped almost into his face, and he saw the momentary gleam of starlight on a skin like oiled leather. His water-bottle was knocked off his little table with a smash.

The sense of some strange bird-creature hovering a few yards from his face in the darkness was indescribably unpleasant to Woodhouse. As his thought returned he concluded that it must be some night-bird or large bat. At any risk he would see what it was, and pulling a match from his pocket, he tried to strike it on the telescope seat. There was a smoking streak of phosphorescent light, the match flared for a moment, and he saw a vast wing sweeping towards him, a gleam of grey-brown fur, and then he was struck in the face and the match knocked out of his hand. The blow was aimed at his temple, and a claw tore sideways down to his cheek. He reeled and fell, and he heard the extinguished lantern smash. Another blow followed as he fell. He was partly stunned, and he felt his own warm blood stream out upon his face. Instinctively he felt his eyes had been struck at, and, turning over on his face to save them, tried to crawl under the protection of the telescope.

He was struck again upon the back, and he heard his jacket rip, and then the thing hit the roof of the observatory. He edged as far as he could between the wooden seat and the eyepiece of the instrument, and turned his body round so that it was chiefly his feet that were exposed. With these he could at least kick. He was still in a mystified state. The strange beast banged about in the darkness, and presently clung to the telescope, making it sway and the gear rattle. Once it flapped near him, and he kicked out madly and felt a soft body with his feet. He was horribly scared now. It must be a big thing to swing the telescope like that. He saw for a moment the outline of a head black against the starlight, with sharply-pointed upstanding ears and a crest between them. It seemed to him to be as big as a mastiff's. Then he began to bawl out as loudly as he could for help.

At that the thing came down upon him again. As it did so his hand touched something beside him on the floor. He kicked out, and the next moment his ankle was gripped and held by a row of keen teeth. He yelled again, and tried to free his leg by kicking with the other. Then he realised he had the broken water-bottle at his hand, and, snatching it, he struggled into a sitting posture, and feeling in the darkness towards his foot, gripped a velvety ear, like the ear of a big cat. He had seized the water-bottle by its neck and brought it down with a shivering crash upon the head of the strange beast. He repeated the blow, and then stabbed and jabbed with the jagged end of it, in the darkness, where he judged the face might be.

The small teeth relaxed their hold, and at once Woodhouse pulled his leg free and kicked hard. He felt the sickening feel of fur and bone giving under his boot. There was a tearing bite at his arm, and he struck over it at the face, as he judged, and hit damp fur.

There was a pause; then he heard the sound of claws, and the dragging of a heavy body away from him over the observatory floor. Then there was silence, broken only by his own sobbing breathing, and a sound like licking. Everything was black except the parallelogram of the blue skylight with the luminous dust of stars, against which the end of the telescope now appeared in silhouette. He waited, as it seemed, an interminable time.

Was the thing coming on again? He felt in his trouser-pocket for some matches, and found one remaining. He tried to strike this, but the floor was wet, and it spat and went out. He cursed. He could not see where the door was situated. In his struggle he had quite lost his bearings. The strange beast, disturbed by the splutter of the match, began to move again. 'Time!' called Woodhouse, with a sudden gleam of mirth, but the thing was not coming at him again. He must have hurt it, he thought, with the broken bottle. He felt a dull pain in his ankle. Probably he was bleeding there. He wondered if it would support him if he tried to stand up. The night outside was very still. There was no sound of anyone moving. The sleepy fools had not heard those wings battering upon the dome, nor his shouts. It was no good wasting strength in shouting. The monster flapped its wings and startled him into a defensive attitude. He hit his elbow against the seat, and it fell over with a crash. He cursed this, and then he cursed the darkness.

Suddenly the oblong patch of starlight seemed to sway to and fro. Was he going to faint? It would never do to faint. He clenched his fists and set his teeth to hold himself together. Where had the door got to? It occurred to him he could get his bearings by the stars visible through the skylight. The patch of stars he saw was in Sagittarius and south-eastward; the door was north – or was it north by west? He tried to think. If he could get the door open he might retreat. It might be the thing was wounded. The suspense was beastly. 'Look here!' he said, 'If you don't come on, I shall come at you.'

Then the thing began clambering up the side of the observatory, and he saw its black outline gradually blot out the skylight. Was it in retreat? He forgot about the door, and watched as the dome shifted and creaked. Somehow he did not feel very frightened or excited now. He felt a curious sinking sensation inside him. The sharply-defined patch of light, with the black form moving across it, seemed to be growing smaller and smaller. That was curious. He began to feel very thirsty, and yet he did not feel inclined to get anything to drink. He seemed to be sliding down a long funnel.

He felt a burning sensation in his throat, and then he perceived it was broad daylight, and that one of the Dyak servants was looking at him with a curious expression. Then there was the top of Thaddy's face upside down. Funny fellow, Thaddy, to go about like that! Then he grasped the situation better, and perceived that his head was on Thaddy's knee, and Thaddy was giving him brandy. And then he saw the eyepiece of the telescope with a lot of red smears on it. He began to remember.

'You've made this observatory in a pretty mess,' said Thaddy. The Dyak boy was beating up an egg in brandy. Woodhouse took this and sat up. He felt a sharp twinge of pain. His ankle was tied up, so were his arm and the side of his face. The smashed glass, red-stained, lay about the floor, the telescope seat was overturned, and by the opposite wall was a dark pool. The door was open, and he saw the grey summit of the mountain against a brilliant background of blue sky. 'Pah!' said Woodhouse. 'Who's been killing calves here? Take me out of it.' Then he remembered the Thing, and the fight he had had with it. 'What *was* it?' he said to Thaddy, 'the Thing I fought with?' '*You* know that best,' said Thaddy. 'But, anyhow, don't worry yourself now about it. Have some more to drink.' Thaddy, however, was curious enough, and it was a hard struggle between duty and inclination to keep Woodhouse quiet until he was decently put away in bed, and had slept upon the copious dose of meat extract Thaddy considered advisable.

They then talked it over together. 'It was,' said Woodhouse, 'more like a big bat than anything else in the world. It had sharp, short ears, and soft fur, and its wings were leathery. Its teeth were little but devilish sharp, and its jaw could not have been very strong or else it would have bitten through my ankle.' 'It has pretty nearly,' said Thaddy. 'It seemed to me to hit out with its claws pretty freely. That is about as much as I know about the beast. Our conversation was intimate, so to speak, and yet not confidential.' 'The Dyak chaps talk about a Big Colugo, a Klang-utang – whatever that may be. It does not often attack man, but I suppose you made it nervous. They say there is a Big Colugo and a Little Colugo, and a something else that sounds like gobble. They all fly about at night. For my own part, I know there are flying foxes and flying lemurs about here, but they are none of them very big beasts.'

'There are more things in heaven and earth,' said Woodhouse – and Thaddy groaned at the quotation – 'and more particularly in the forests of Borneo, than are dreamt of in our philosophies. On the whole, if the Borneo fauna is going to disgorge any more of its novelties upon me, I should prefer that it did so when I was not occupied in the observatory at night and alone.'

Director's note

Colugos are arboreal gliding mammals that inhabit south-east Asia. They are about 14–16 inches in length and weigh about 2.2–4.4 lbs – comparable to a medium-sized possum or a very large squirrel.

'Colugo' is also the brand name of a mountain terrain flying suit. For a demonstration, see http://vimeo.com/64409540.