SHERWOOD OBSERVATORY History Sheet for Event Speakers

The Dome

The dome is driven by motors from an industrial knitting machine.

Rotates on rollers, which were originally made using discarded conveyor belt rollers from Pleasley Colliery (Pleasley also provided many of the bricks used to build the Observatory – originally from their canteen).

The cladding on the dome was made with discarded aluminium screen-printing sheets from a local printers. They were cut, drilled and riveted together by hand, using approx. 6000 rivets.

Dome diameter is 6.5metres which is the same size as the JWST primary mirror.

The strip lights around the perimeter can be dimmed, and are changed to a red light to preserve night vision. There is also a red light fitted above the spiral stairs, again to enable visitors to negotiate the stairs but without affecting night-vision.

The long umbilical cord hanging up next to the control panel was created to be used that in the event of the dome getting stuck, the cable plug can reach any part of the dome and can be plugged in to enable the aperture shutter to be closed. Thankfully this piece of equipment has barely been called upon!

The ‘ceiling’ of the dome was originally clad with polystyrene tiles for insulation, mounted with a gap behind them to reduce condensation. However, we now know these types of tiles are hazardous so several years ago they were taken off and the dome interior was painted with a special anti-condensation paint.

Either side of the aperture are yellow lines – if you look at the end of the scope there are infra-red sensors attached. As the telescope moves whilst tracking an object, the sensors when switched on using ‘auto-track’ on control panel, will be activated and as soon as the infra-red beam bounces off a yellow line, the dome will automatically rotate until the sensor on the opposite side of the telescope senses the yellow line on the other side of the aperture.

Dome construction completed in 1976

The Fork Mount and Telescope Frame

The mount itself is fitted upon four steampipes which run all the way down through the building and into the foundations. This means that no part of the mount is affected by anybody walking/running/jumping on the floor you're standing on.

The mount type is in a configuration known as an Equatorial Fork Mount – which basically means the central hub of the fork mount is fixed upon a rotating axle which is lined up to match the Earth's rotation. In our case a latitude of 53 degrees, 6 minutes and 50 seconds. For perspective – if we were on the North Pole, the axis would be pointed straight up, and if we were on the Equator the axis would be horizontal. The telescope frame is then attached to the two pivot points at the end of the fork 'prongs'.

This then allows for the telescope to follow the path of anything we are viewing in the night sky, automatically at a 'very' slow set speed – this is known as tracking and the side-to-side movement is called 'Right Ascension'.

The central hub axis is made from half a rear axle shaft off a disused lorry – complete with wheel bearings and brake drum housing facing upwards and to the North. This has a load capacity of 15-20 tons so way more than suitable for our 1.5ton telescope!

Originally the motor which drove the fork mount was sourced from a golf buggy, and the motor which moves the telescope up and down (known as Declination) is a windscreen washer motor from a Landrover!

The chain which drives the declination is from an industrial knitting machine, and can be seen if you look through the small window on the side of the fork mount. Another length of the chain is also welded to the track in the middle of the dome aperture.

These motors have been upgraded and replaced over the years and are now run using DC Servo Motors which only require 19 volts to operate them.

The fork mount – as well as the bottom section of the telescope truss, is clad with panels cut from discarded Pit Weighbridge signs.

The mount is automatically set to slowly track the stars, there is also a setting that can track the moon which moves differently. And via 2015 upgrade a wireless handset can be used to manually move the scope to any desired visible object.

We can also connect the mount to our computer and once we have calibrated, we can use the computer program to direct the telescope – especially useful for dim objects like galaxies which we cannot see with the naked eye.

Scope Mount and Truss tube completed late 1975/early 1976

The Telescope and Optics

Our Telescope is known as a 24” Newtonian Reflecting Telescope. Officially named The Gordon Jones Telescope after one of our founding members and main designer of the scope.

Handbuilt by the founding members of the society.

It is of a ‘Serrier Truss’ design – the trusses being scaffolding poles left over from the original construction of the Observatory building – nb the wooden scaffolding boards were re-purposed to make window sills downstairs. The design solves the problem of truss flexing by supporting the primary objective mirror and the secondary (small) mirror by two sets of opposing trusses, before and after the side pivot point. This allows for an equal amount of flex, which allows the optics to stay on a common optical axis (ie everything lines up nicely)

The panels at the bottom of the truss tube are made from discarded Pit Weighbridge signs.

The scope works by receiving light through the tube, reflecting off the very slightly concave 24” Primary mirror, the curvature causes the reflected light to converge and bounce off the 6” Secondary mirror, and as this mirror is set at an angle, the reflected light is then directed into the eyepiece that you look through.

Originally it had three mirrors, known as a Nasmyth telescope design: however this was changed to a two-mirror design in the late 1980’s.

The scope is capable of a magnification of 272x but 100x is a more comfortable view as the eyepiece opening is then a little bit larger. Remember magnification isn’t everything – the telescope is the size that it is in order to collect more light and be able to see faint objects, rather than get extreme close-ups.

The glass was ordered to create the 24” Primary and 6” Secondary mirrors, and the ‘mirroring’ process began in 1979.

To save money the glass was ground and polished by hand, using a device handbuilt by Gordon Jones, one of our founding members. Yet again made using castaway items, mostly from various cars, and powered by a washing machine motor!

The Primary mirror wasn’t a solid piece of glass, but rather two 1” thick pieces of glass bonded together with some 1” thick glass spacers to make a 3” thick mirror with an air gap through the middle.

As mentioned above, the mirror is not a flat surface, but rather a bowl-shaped design, with the bottom of the bowl being 3.175 millimetres deep (known as the Sagitta Drop). Not a huge depth but essential to proper focus.

Once the depth was achieved, the glass was further configured using a change of grinding tool and finer grit to make the mirror into what’s called a parabolic shape – this helps achieve a clear and perfect image and avoids the purple fringing that otherwise happens with a spherical mirror.

After this the mirrors were polished, silver-dipped and mounted onto the scope frame.

The weight of the mirrors meant that lead weights were mounted upon the inside of the truss tube to help counterbalance the whole assembly (which can be pointed out at the far end of the scope).

In all the grinding, polishing, silvering, mounting & collimating took 4 long years!

Finally in 1983 First light was achieved with the target being M42 The Orion Nebula.

Observatory was officially opened in 1986 by Sir Francis Graham-Smith, Astronomer Royal, with our scope being the largest publicly accessible scope in the UK.

In the Mid 1980's it was found that the Primary mirror had developed a fault – it was 'de-laminating' and unfortunately could not be repaired. A new mirror, custom made was purchased – using Gordon's grinding machine as part-exchange.

A CCD camera was fitted to enable astrophotography, however this brought up another issue – images were showing star trails (elongated stars) and in June 1991, after the mirror was inspected by an expert in the field, it was re-worked and refitted.

The primary mirror has a protective cover which is opened/closed with the help of a car jack attached to a windscreen wiper arm.

The secondary mirror has a handbuilt, manual hinged cover.

Also fitted is an 'iris' which can be operated to reduce the amount of incoming light – useful when viewing the full moon. The blades of the iris were hand cut from sheets of aluminium, using tin-snips.

Telrad finders are fitted to the scope to help enable rough manual alignment to objects.

The eyepiece holder is of a 2" diameter design to enable larger and more comfortable to use eyepieces to be utilised. There is also an adaptor which can be fitted to enable use of the more common 1.25" eyepieces.

In 2022-23 Funds were raised to purchase a new Primary and Secondary mirror. These new mirrors, produced by a specialist company and of the highest optical quality were fitted in 2024. First light was achieved on 3rd March 2024 at 20:30 – as with the 1983 first light, the target was M42 – The Orion Nebula.

Sherwood Observatory History Sheet for Event Speakers.

2024 Version 1.2

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