



CAMBRIDGE UNIVERSITY ASTRONOMICAL SOCIETY

Observing Guide

Members of CUAS have the opportunity to use both the Northumberland and the Thorrowgood telescopes whenever they like, as well as all the other observing equipment stored in the annexe next to the Northumberland. To do this, you will need an ObsCard, and to get an ObsCard, you need to have attended two ObsDemos and passed a very simple test. We'll give you this guide when you've done both of your ObsDemos. Firstly, this guide will go through how to get hold of the keys, and general housekeeping points about observing once you have an ObsCard. The second part of the guide will go through all you will need to know about the telescopes in order to pass your ObsTest¹.

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¹If you think that this guide is missing something, i.e. something has changed that I'm not aware of, or is unclear anywhere, please contact me (Alexander Buell) at ab761@cam.ac.uk and I'll make sure I'll update it

1 Observing On Your Own

The Northumberland telescope is nearly 180 years old, and the Thorrowgood is only 30 years younger; both are historical relics in their own right, and still provide fantastic views of the night sky. For many years, CUAS members have had full use of the telescopes.

1.1 Before Going to the Telescopes

You cannot open the roof of the telescopes if it is raining, not to mention that it would be too cloudy to see anything anyway. Check the weather first, either by looking out the window or, failing that, use the online all-sky camera at the IoA, at <http://tel05.ast.cam.ac.uk>. If you want to check in advance, use the met office website at www.metoffice.gov.uk.

You may need a torch once you are there, but remember to use a red light to save your night vision. Remember that the telescopes are used for Public Observing Nights on Wednesday evenings, and so the telescopes are unavailable then.

1.2 Getting Hold of the Key

To get hold of the key, go to Churchill Porter's Lodge. You must sign for the key here in the Obs-Book. Make sure you have the key with you at all times, particularly when you leave the domes. It goes without saying that you should never hand the key over to anyone that doesn't have their ObsCard, but if you wish to hand over the key to another observer, this second observer will need to have signed, as otherwise the first observer will be held accountable if the key is missing. If need be, the second observer can sign at Churchill and then instead hand their ObsCard to the first observer, who can then swap their ObsCard when they get back to Churchill. The second observer can then pick up their ObsCard at the end when they hand back the key. If such an exchange of ObsCards is done, it should be documented in the book in the Northumberland annexe and countersigned by both parties.

Bringing along a few friends is fine, but if you would like to bring a large group, i.e more than 5 people, please ask an ObsSec first (the numbers and email addresses are at the end of the guide). Alcohol and observing do not mix, so don't try it. Remember that you are dealing with very precious, historical instruments!

1.3 In the Annexe

Before observing, head straight to the annexe within the Northumberland dome. Within the annexe, there are two books that need to be filled in.

- **Attendance Book**

This must be filled in every time you use the telescopes.

- **ObsBook**

Put in here notes about any observing you did, and also any problems you noticed with the telescopes. For example if you notice that the telescope had not been properly put away by the person before you, or if you notice any defect or even if you happen to break something. Be honest, everybody makes mistakes and it is just very important that everything is documented such that the people of the IoA who look after the telescopes have it easier to fix it.

1.3.1 Binoculars

If using the Vixen binoculars, record all observations in the ObsBook Ū they have been donated by the BAA and they would like to know how they have been used. They should be used with the tripod found in the Northumberland dome. Only use them if you are confident you are able to to handle them properly; you should perhaps contact an ObsSec if you are unsure.

1.3.2 The David Payne Telescope

A 12.5 inch handmade Dobsonian telescope recently donated to CUAS that is quite simple to use, but please bear these points in mind.

1. Firstly, remove the telescope tube from the base, then take the base outside and then the telescope. Set it up on the grass; not on the cycle path - you don't want to be run over by a cyclist while you're observing!.
2. There are eyepieces for it in a plastic box. The eyepiece holder doesn't hold the eyepiece in very securely, so make sure the telescope is the right way up such that the eyepiece points upwards so it can't fall out. It is best to only put the eyepiece in once you have the telescope set up.
3. Remember to replace the plastic covers and the paper protecting the eyepiece holder from allowing dust in after use.

It is an altitude-azimuth mounting so bear this in mind when trying to find objects using star charts. If the image quality seems poor, please contact an ObsSec. They will then investigate the state of collimation and correct it if necessary. Dobsonian telescopes (a type of Newtonian, or reflecting, telescope) are ideal for observing deep sky objects. Due to its large objective diameter, it acts as a "light bucket".

2 Using the Telescopes

This will guide you through how to use the telescopes in the dome, and should contain everything you need to operate them safely, although it is no substitute for two ObsDemos. Many initially find observing difficult, but with much practice get better. When observing, please remember,

- Never leave the domes unattended! Close the door of the Northumberland dome when you are going to use the Thorrowgood telescope.
- In the case of rain, close all domes immediately.

2.1 The Northumberland Telescope

This is the large telescope in the large dome. It is a 12-inch refractor, and has a 20ft focal length. It was built in 1838, from a design by George Airy. The telescope is very famous, and was one of the largest when it was built. Interestingly, James Challis observed Neptune with it but didn't report it.

Upon arrival, check everything is left properly. If not, note this in the ObsBook. In particular make sure it is unclamped at the base before moving it.

2.1.1 Take the Lens Cap off

There is a plastic bag covering the end of the telescope, which also has a lens cap; both must be removed. Move the telescope slowly. Do not grab it at the eyepiece or finderscope, and use the frame to rotate it

- Never ever point the telescope below the horizontal (roughly below metal railing on dome wall). The lens is not secured and will misalign or even fall out if you do this!
- Remove the plastic bin-bag, metal lens cap and the metal cap on the finderscope.

2.1.2 Find Your Item

Many people will use star charts to find objects, but using the computer is very simple and quick to find any object in the sky. In most cases, a terminal should be open already and the program running. If not, to start up the program, bring up a terminal (there is a shortcut button in the systems tray) and then type telescope followed by RETURN.

"Telescope" gives the telescopes current Right Ascension and Declination; the right ascension can also be read from the display above the computer.

"Target" gives the position of the target. There is a pure declination scale which matches up with the central rib of the telescope, but for fine adjustment, use the tape measure length reading at the bottom right.

To find a target using the computer, use the following commands in the terminal:

- **Deep Sky or Stellar Targer**
Type `gocat x` where `x` is the name of the object followed by return.

- **Planetary Target**

Type `planet x` where `x` is the name of the planet, followed by RETURN. Then type `next` and hit RETURN.

Then, move the telescope to the right ascension that it gives you. The box at the bottom left will go green when you are close and disappear when you are very close.

2.1.3 Opening the Dome

1. Point telescope away from the slits so dirt does not fall onto the lens.
2. Unlock the dome by pulling the rope with the lead weight. Sometimes this can take some force.
3. Open the dome. Apply tension to unlocking rope while opening dome, in case the latch falls back.

Move the telescope slowly. Do not grab it at the eyepiece or finderscope.

- Rotate the dome roof slowly. You cannot move it through the north part where there are struts, so beware the momentum of the dome, or it will jam

2.1.4 Using the Motor Drive

When the motor is engaged, the telescope will move with the sky, keeping your object in view. This new drive system was installed in October 2009, and to ensure it lasts many years, we need to take care to ensure that the various parts do not get worn down.

1. With the worm disengaged, and the 3 hand-wheel clamps unclamped, verify that the wheel is free to rotate independently of the polar axis of the telescope.
2. Switch on the power to the controller box, by turning the rotary switch a quarter turn clockwise.
3. Engage the worm with the wheel, and allow it to mesh fully, so that the load is not taken only on the tips of the threads.
4. Move the telescope a small amount in R.A. to the position you require, as your target will have moved since you located it - if the wheel is free (see 1 above), this will not damage the worm.
5. Tighten the hand-wheel clamps at the lower, north, edge of the wheel. You should notice the right ascension slow down and stop.
6. Use the guiding and setting motions provided on the hand-paddle. There are buttons on this which will move. Guiding motion lasts only for about the first two seconds; after that the motor accelerates (or slows down) smoothly for 10 or 15 seconds. Watch the R.A. display to see how far you have moved; the faster, setting, motions are no faster than the sidereal rate.

7. There are large square push buttons near the rotary switch. These select either sidereal rate (red) or a "lunar" rate (yellow) which is 3 per cent slow. The default is the sidereal rate, but it changes instantly and you will see the result in the R.A. display.
8. When packing away, do everything in reverse. First disengage the wheel from the telescope via the clamp. Before switching off the motor, decrease the speed of the motor by increasing the R.A. to reduce wear on the worm. Then, disengage the worm.

It is very important that you get this procedure right, and so if you have any questions contact an ObsSec. Overall, remember

- Do not move the telescope manually while the worm is engaged and the clamps are fixed!

2.1.5 Eyepieces

Eyepieces are very delicate, just as the telescopes are. Never touch the glass surfaces. There are 2 boxes.

- **Ordinary Eyepieces**

For ordinary use, take the ones which are in the box labelled 'Northumberland Dome'. These should usually be sufficient for most observations.

- **Meade Eyepieces**

The other box contains newer Meade eyepieces. These need extra care in handling as they are expensive to replace. In particular, be extra careful not to touch the lenses as they are coated and it could damage the coating. There are some tissues in the annexe to wipe your eyelashes with before using these eyepieces.

Never attempt to clean any lens or eyepiece yourself. If it is dirty, note it in the ObsBook and someone will do it properly. Make sure the eyepiece boxes are closed and the new eyepieces are put back in their plastic cases before leaving.

2.1.6 After Observing

When you have finished observing, follow this procedure.

1. Replace all lens caps.
2. Make sure there is an inexpensive eyepiece in the telescope (to prevent spiders and insects getting into the telescope).
3. Point the telescope away from the slits before closing the dome.
4. Make sure you leave the slits away from any electrical equipment in case it rains.
5. Close dome and lock the latch. Be gentle when doing this.

6. Return the telescope to a vertical position, as there is least mechanical strain on the lens in this position.
7. Make sure the motor is switched off and all three clamps are disengaged. Do not turn it off at the plug.
8. Sign out in the ObsBook and Attendance book in the annexe.
9. Make sure the dome building is locked after you have left it.

2.2 The Thorrowgood Telescope

This is the smaller of the two telescopes, found in the smaller wooden dome. It is an 8-inch refractor, built in 1864. The focal length is 114 inches (f/14). The mounting is an example of the 'German' form of equatorial mounting, which means the entire night sky is visible. It was bequeathed to RAS in 1928, and is now actually on extended loan to us from them.

2.2.1 Moving the Telescope

When first arriving at the telescope, you should find that there is a wooden apparatus affixed to the viewing end. This is the solar projection unit, and the telescope is not balanced without it – it must be clamped in DE unless it points vertically upwards or you are moving it. Use the octagonal knob (the shortest handle) to do so. As with the Northumberland, never point the telescope below the horizontal.

Be sure to move the telescope slowly. The dome is (very slightly) too small, so there is a risk of touching parts of it with the telescope while moving it. Lower rotation speed means less possible damage in this case. The dome is rotated with a pulley system and should also be moved slowly for the same reason. To open up,

1. Point the telescope away from the slits.
2. Open the right slit first, then the left one. It will not work the other way round!
3. Remove the lens caps on the main telescope and the finderscope.
4. Remove the solar projection unit. To do this, first pull out the metal pins and then pull the two wooden parts of the unit apart, or simply remove the entire lens at one.
5. Replace the solar lens with a normal one.

The telescope has a German mount. This means that, unlike the Northumberland you can observe all parts of the sky, including the northern celestial pole. To move the tube from the eastern to the western side of the pillar, you have to move it via south, i.e. over the pillar. Otherwise the tube will collide with the mount (which is not good).

2.2.2 Using the motor drive

This will track your object round the sky for you. The motor drive in the Thorrowgood is quiet, so listen hard to check it is on.

1. **Engage the RA clamp**

Before turning the motor on engage the right ascension clamp, which is the metal T-shaped clamp. Use the metal pole if the RA clamp is out of reach.

2. **Turn the motor on at the switch on the wall.** Sometimes it takes a while before it starts tracking properly. It may be necessary to get your desired object back into the field of view.
3. **Use the middle handlebar for fine adjustments.** Do not attempt to pull the telescope manually while the motor is tracking.
4. **Swap the solar projection eyepiece** Change it with one from the wooden box. Alternatively, you could just use the solar projection eyepiece for its wider angles of view.

The two remaining knobs are for slow motion in DE and RA.

2.2.3 Solar Observations

Can be very hazardous, so be careful. Use the solar projection unit. Do not use an eyepiece, as it will damage them. It hardly needs to be said, but please

- Do not look directly into the sun, especially not through a telescope. This may immediately cause severe damage to your eyes!

There are cardboard aperture-reducing plates for solar observations. The chart on the wall tells you which you need to use at what times of day or year.

2.2.4 Closing down the Thorrowgood

1. Make sure the motor is switched off.
2. Point the telescope away from the slits.
3. Replace the solar projection unit. Be careful to place the wooden parts together the right way. The side saying TOP should point upwards.
4. Replace both lens caps.
5. Close the slits, doing the left one first. To do so, pull the cable next to the slit to unlock the slit-door and then gently let them fall shut. Take care; the doors are rather heavy.
6. Rotate the dome roof to line up its corners with the corners of the walls. Do not park the slits above the signs telling you not to do so.
7. Leave the telescope vertical and unclamped in both axes.

So, that is (hopefully) all you need to know about using the telescopes. If you have any queries whatsoever, or just want some ideas about observing, then feel free to contact either of us using the contact details below. Apart from that- happy observing!

CUAS Observation Secretary 2010-2011

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