How to Run a PWT Tour

The aim of this activity is to demonstrate the Philip Wetton Telescope, and talk a bit about the science/outreach that is done with it. Depending on the event and weather, you may then do some observing through the telescope, typically through the eyepiece. You, as activity leader, will also be the telescope operator (TO).

You will need:

- PWT
- Telescope training

Before the Activity:

The general working of the telescope will have been explained in the Telescope Training session, and hence it is assumed that the TO knows how to operate the telescope. The telescope has to be prepared for observations (if any are to be done) - see the PWT demonstrator's guide (in prep?) for details.

During the Activity:

Safety points to remember;

- Turn the stair lights on when you're bringing members of the public and down the stairs. There is a switch at the bottom (outside) and top (inside the dome, by the door). Turn them off once people are in the dome.
- If it has been raining, there will probably be a wet patch on the dome floor near the top of the stairs. Try to clear this up with paper towels before people come up.

The general layout of the activity depends on the activity and the weather. If we can do some observing via the eyepiece, then after a brief introduction to the telescope and its science, you will point the telescope at various objects, and, as the audience take their turn observing, lead a discussion of that object. Very detailed information is not required but general information on what the object is, how it may have formed is good. People always seem to be very interested in how far away objects are, so having that info to hand useful! The goal is to encourage the audience to ask questions about what they are seeing and doing, and then to help them think through how they would answer that question. We are teaching science, not facts.

The group size is typically 10-15 people, and each person tends to spend 30-60s at the eyepiece. This means you can get through 2--3 targets per group. You should plan these out, depending on time of year. Planets and the Moon (look at the terminator for the best effect) are obvious choices. The table below gives some suggestions by season. Bright nebulae and clusters are good. Galaxies tend to look like disappointing smudges. For many visitors, this will be the first time the have looked through an eyepiece. It takes a bit of getting used to, so be patient with them. Do however encourage them ***not*** to stick their finger on the

lens when they say “what, look in this bit?”. It’s useful to leave the dome lights on low, certainly until people are comfortable in the dome and understand where they need to look in the telescope.

Sep/Oct	Albireo / Beta-Cygni	Binary star with nice colour contrast. “Head” of Cygnus the Swan.
Sep/Oct	M57 (Ring Nebula)	Small but bright planetary nebula.
Sep/Oct	M13	Globular cluster.
Nov/Dec	NGC 864 / NGC 889 (The Double Cluster)	Two nice open clusters, which just about fit in the field of view. The Pleiades (M45) by comparison are too big for the main telescope, but good in the finder.
Nov/Dec	NGC 7662 (The Blue Snowball)	Planetary nebula. Small, but bright. Quite a few people do manage to perceive it as blue (good lead in to why other things just appear grey).
Nov/Dec	M31 (Andromeda galaxy)	A popular request, but not that impressive in the telescope. Good demonstration of why magnification is not always a good thing (compare the main scope and the finder).
Jan/Feb	M42	Orion Nebula. Star forming region.
Jan/Feb	M36/M37/M38	Nice open clusters.
Jan/Feb	M81 (“Cigar” Galaxy)	Starburst galaxy. Good for more experienced groups. Needs a good clear sky.
Mar/Apr	NGC 2392 (Eskimo nebula)	Small, but quite bright, planetary nebula.
Mar/Apr	M3	Globular cluster.
Mar/Apr	M87	Giant Elliptical in the Virgo cluster. Good if you have a more experienced group with you. Bad for kids. Needs a good clear sky.

Using the guide scope camera

The guide camera is usually left attached to the guide scope. You can use this by logging into the computer on the desk, connecting the to the telescope control computer, and starting up ‘MaximDL’. The field of view of the guide camera is about 1 degree, and it makes a very nice comparison to what people see through the eyepiece. Use exposures of 1-10 seconds for nebulae and galaxies, 0.1-1s for planets/moon, and <0.1s for didcot chimney. Please do not change the focus of the guide scope.

Cloudy nights

If observations cannot be made, the activity becomes a discussion of the telescope and its science. If the night is cloudy, but dry, you can open the dome with the lower shutter lifted, and look at college steeples in the horizon -- see who is the first to point out they are upside-down! The red lights on the top of didcot power station chimney (visible on the horizon in the south-south-west) make a good demonstration of "seeing" and atmospheric turbulence. To point to these, change the telescope alignment mode to 'Polar' and slew to the coordinates in the table below. Once you have centred the object in the eyepiece, change the telescope alignment mode to 'Land' to stop the tracking.

Didcot Chimney	Altitude: -37:56 Azimuth: 00:14	Three red navigation lights on the top of the chimney make good artificial stars. You can defocus the eyepiece to make an effective demonstration of 'seeing'/turbulence.

If it's a rainy night, we often leave the CCD attached to the telescope rather than the eyepiece. You can use this to explain how the telescope usually runs (taking images robotically). From the back forwards, you have CCD camera, Filter wheel, Guide camera (sticking out at 90 degrees) and Focuser (blue bit).

You can also show people the observatory webpage, which has pictures and a real-time display of the status; http://observatory.physics.ox.ac.uk/ (people often like to note this URL down for future reference). To show what a clear sky Oxford can be like, you can go to the All-sky camera link. This shows the output of the All-Sky camera on top of the stairwell that takes a picture of the sky every minute. In the video page, go to 2012-09-08, which was a nice clear night. The objects that don't move are hot pixels in the camera.

Typically this discussion will, and should, become quite general, with many questions coming up about the telescope or general astrophysics.

Background information

Telescopes in Oxford go back a long way (at least 1770s, probably earlier), but unfortunately Oxford has not managed to keep any of it's historic telescopes (the Radcliffe observatory, originally on the Radcliffe site, was moved to South Africa in the 1920s in search of better skies; and our lovely 12-inch Grubb refractor went to Keele in the 1960s!). The Philip Wetton Telescope is a relatively new telescope in Oxford, and was originally installed in the old observatory buildings (off South Park Road) in 1995. In 2005 it was moved over to the current dome on top of the physics building, to make it more accessible. The telescope pier is actually sitting on top of the lift shaft!

The main goal of the telescope is to provide a facility for outreach (letting people look through the eyepiece) and undergraduate teaching. When the telescope isn't being used for outreach, the eyepiece is taken off and a CCD camera (a specialised digital camera) is put on. This allows the telescope to take images of the night sky, and to detect/study objects

much fainter than can be seen with the naked eye. It also allows the brightness of objects to be measured through different coloured filters. Some of the objects studied with the telescope include star clusters, extra-solar planets and supernovae.

Night sky conditions in Oxford aren't quite as bad as one might first suspect. The light pollution is bad (~20x brighter than at a dark sky site), but the atmosphere is quite stable, giving relatively sharp images (though ~2-3x worse than at a professional mountain top observatory). The sky is clear about 30% of the time, meaning we have about 110 nights per year when the telescope can be used. The problem of course is being able to use the telescope through the night, and still keep up a day job. Over the last few years, the telescope and dome systems have been upgraded to the point where (since mid-2012) the telescope is capable of operating robotically. Observation requests are uploaded to a 'queue', and the telescope automatically observes them when the sky is next clear. The new systems mean the telescope, though small compared to professional telescopes, can actually do some valuable scientific research work. In particular, it is suited to monitoring variable stars which are relatively bright, but need to be observed regularly; something which is hard to do with larger professional telescopes.