

## Observatory Building

Ever since I was a child, I had a dream that one day I would have my own observatory. I can remember driving past the Jeremiah Horrocks Observatory in Preston, Lancashire on a regular basis, and every time I saw it I wished that we could buy it! When I got my first telescope at 11 years old, I had a master plan that involved sliding doors in the roof and a full loft conversion to house my future telescope collection.

Fast forward to 2011. That is when I met my now fiancé, Mark. He has also had a lifelong passion for all things astronomy and he too had a dream of one day having his own observatory. We were both captivated by the astronomy domes that were on display at Astrofest in London, but being a practical person, Mark was also interested in the observatory sheds which have a roll-off roof. We had talked about it as a bit of a pipe dream, hoping that one day we might be able to build something of our own.

In 2013 we moved into our new house in rural Oxfordshire. We are still completely in awe of how amazing the skies are from our back garden. We have nothing but fields behind us and very little light pollution in most directions apart from the South. When we moved into the house, we found an old shed in pieces at the bottom of the garden. Mark looked it over and began to form a plan to convert this discarded shed into an observatory. He spent a lot of time researching via the internet, reading other people's blogs and looking at online instructions. It didn't take him long to come up with a workable solution. Plans were drawn up, sketches made and photos printed out. He then sourced all the bits that we needed to upcycle the shed, along with all the building supplies we needed. At this point it hadn't really sunk in that we were finally going to have an observatory of our own. Then the bits began to arrive in the post; first was an alarm system. We were both very adamant that the shed needed to be secure because we know of a number of people who have had astronomy equipment stolen from their gardens. Next came a metal mounting plate, then the wheels for the roof. Slowly all the individual components began to build up, and so my excitement mounted!

Work began in March 2014. We had a spot at the end of our garden which was perfect for our observatory shed. One of the most important parts was the pier. It needed to be very stable so that any of our existing telescopes could be mounted onto it, and also any new, larger telescopes that we may buy in the future. He began by clearing the area. Then he marked out the footprint of the shed, and put the corner posts in place. He dug trenches around the sides and part-filled them with concrete. This gave him a solid base on which he put a few rows of bricks. Each of the 4 walls of the shed would sit on top of the bricks. Once we had the footprint marked out, we could decide on the location of the pier. Once we'd agreed that, Mark dug a hole where the pier would be positioned. He drove a metal stake several feet into the ground, and then placed a long piece of drain pipe over the top of it. The pipe was then concreted into place. Concrete was also poured down into the bottom of the drain pipe to secure the pier stake in place. Once we'd checked the height we needed the mounting plate to be, we cut off the top of the pipe, then filled it to the top with more concrete. While it was still wet, 4 large bolts were set into the concrete, which would later allow the angle of the mounting plate to be adjusted to get everything at the correct level. Drilling holes in the mounting plate took ages and Mark worked his way through several drill bits before that job was complete!

Once the concrete had set, Mark set about building a frame work for the suspended wooden floor. It was important that the floor didn't touch the pier, so that walking around inside the shed wouldn't cause any vibration to the telescopes, so he left a gap of around 2cm all around the pier pipe. Once

the floor was down, the sides of the shed were put into place. Next came the uprights which would hold the runners for the roll-off roof. Having measured very carefully, the upright posts were concreted into place, and the cross beams fitted along the ends. He then took the long pieces of wood which would act as runners, and using a router he cut channels into the wood which were large enough for the wheels to fit into. He drilled small drainage holes in the channels to allow rainwater to escape. Then he began construction of the roof.

It was really important that the roof be lightweight and easy to roll back, so Mark used a design which he had seen somebody else use online. It consisted of a wooden framework with a pitched roof made from corrugated plastic sheets which overhang the edges to keep the rain out. It didn't take him long to make the roof once he got going. The wheels were fitted onto each corner of the roof, and it was put in place. It worked perfectly the first time! Retaining clips were fitted to the inside so that the roof could be locked into place from the inside when it was closed. Once the roof was done, he finished off the gable ends with wooden panels and the main construction was completed. The whole thing was given a few coats of wood preserver.



Inside, Mark lined the walls with hardboard panels and I painted them. I had barely given the walls time to dry before I started putting our favourite posters up on the walls! He fitted some self-adhesive floor tiles to finish off the floor. We decided that now was a good time to invest in a new telescope mount to upgrade our existing mounts. A friend had kindly let us borrow his EQ5 Pro to see how it suited us. We both loved it, so we ordered one of our own. Mark spent a long time getting the mounting plate level and polar aligning the mount. He also spent time drift aligning it to make sure everything was perfect. So then we were ready to put our most often use telescopes into

the observatory shed. Because of the design of Mark's 10" Dobsonian telescope, it would not be practical to use it inside the observatory shed because the walls were too high. It was too heavy to carry in and out, so he put casters onto its base, and built a concrete ramp up to the door of the shed. This would allow us to just roll the telescope in and out of the shed each time we wanted to use it. The other 3 telescopes we can swap and change onto the pier depending on which one we want to use.



Power was another important consideration. Running mains power to the shed wasn't an option at this time. However, if we were planning to do any long imaging sessions, or if we wanted to use more than telescope at once, we would need something that could last longer than our little astronomy power-pack. Time for some more upcycling! I had a spare set of mobility scooter batteries, so Mark wired them up in parallel and bought a solar panel which would trickle charge them during the day. We also have a proper battery charger for them to top them up if they've had heavy use. So far this system is working really well, and the batteries have a much higher capacity than the power-pack.



Having this observatory has had a huge impact on my life. Being disabled means that I can't carry telescopes in and out of the house, so my observing time was severely restricted before. Now, anytime there is a clear night, I can just open the roof of the observatory, chose which telescope I want to use, and off I go without any lifting or carrying. It doesn't matter what time of night it is; even if Mark is asleep I can go out and get things set up by myself. There isn't enough room in there for my wheelchair, but I have a folding walking stick seat which is absolutely perfect for perching on while I'm observing or imaging. The new mount is a dream to work with. Prior to having this, I had a very basic mount on my 102mm refractor which didn't track. So from an imaging point of view I was restricted to 1 second exposures. The new mount has opened up so many possibilities. People are always saying that the mount is the most important piece of astronomy equipment you'll buy, and now I can see why!

The first thing I did was to photograph the Sun and the Moon. Having the mount tracking the object at the correct speed makes it so much easier to get the object in focus. Before, the object would have moved out of my field of view before I'd even got the focus right, let alone taken the photo. It improved the quality of my images straight away. Then as the nights began to get darker again, I started to try imaging some more deep sky objects with my Helios 102mm refractor. This is a budget telescope, but putting it onto that mount has transformed it into something that you can actually get some decent images from. I like this telescope because when my DSLR is mounted at prime focus, you get a really wide field of view. I am really looking forward to giving the telescope and mount a really good workout now that the nights are getting darker again. Top of my list of targets is M45 - The Pleiades. It's one of my favourite binocular objects, and last year I spent hours trying to stack hundreds of single 1 second shots and trying to bring out some nebulosity. It was a real uphill struggle. Now that I have access to this mount, I can't wait to get started on this object!

In addition to the new mount, Mark recently bought a CMOS imaging camera. We had both been looking at these for some time, but decided on the ASI120MM. Now that we have a mount that tracks so well, it was worth investing in this camera. So far I've only used it on the Sun and Moon, but I am already in love with it, and had a lot of fun producing my first Moon mosaic. We have had a filter wheel for a couple of years but still haven't used it. I'm so looking forward to doing some narrowband imaging of M42 - The Orion Nebula. Another target that I've been trying to image for years, is the Horsehead Nebula. Perhaps this year I will manage to pull out this elusive target. Now my biggest problem is that I keep filling my hard drive with astronomy imaging data and I'm certainly giving my processing skills a serious work out!

If you are thinking about building an observatory of your own, then don't think anymore; just do it. I can't claim any of the credit for the building of ours; it was all Mark's hard work doing the planning and execution. But I can't put into words how it makes me feel when I'm standing in there, the sky above me, wind in my hair, while my camera clicks away imaging my next target. After all those years of dreaming, we actually have our own observatory shed, and I will never be able to thank Mark enough for making our dream come true.

*If you want to find out more information about building your own observatory shed, here are some links that you may find useful.*

How to build a telescope pier:

<http://www.skyatnightmagazine.com/feature/how-guide/how-tobuild-back-garden-telescope-pier>

How to build an observatory shed:

<http://www.astrosoft.co.uk>

[https://www.flickr.com/photos/spicey\\_spiney](https://www.flickr.com/photos/spicey_spiney)