Gearheads

R Jay GaBany is one of the world's most renowned astrophotographers, with his images gracing many magazine and websites. He tells Gearheads how he achieves his magnificent results with his remote Blackbird Observatory.

Remote **viewing**

▲ **Blackbird Observatory, nestled in the mountains of New Mexico. All images: R Jay GaBany.**

I began taking images from my back garden in suburban San Jose, California about six years ago after thirty years of visual observing. However, I couldn't have chosen a much worse location because my neighborhood is surrounded by over three hundred streetlights positioned about 30 meters apart. The glare from these lamps makes it possible to read a newspaper without assistance at midnight. Still, I was undeterred and determined to take pictures through my telescope. But these first images were awash with bright background gradients instead deep space darkness. Counter-intuitively, I discovered that extremely long exposures made it easier to remove the light pollution filling my pictures during post-production. As a result, I spent most of my time trying to salvage the astronomical subjects in my photographs rather than enhancing them.

After a year of battling these local conditions, I searched and discovered a telescope located under clear, extremely dark skies in the south central Sacramento Mountains of New Mexico, USA about 1,200 miles from my home. The instrument could be remotely controlled using a common Internet browser, featured an aperture of half a metre and was available for a relatively modest hourly rental rate. After one session, I was hooked and within three months sold my back garden instruments, purchased a large block of time and began exposing pictures long distance. Within a year, I became the telescope's owner because I realised that nothing is more important to successful astrophotography than working under dark skies untainted by city lights. Without pitch black skies, everything else (seeing, telescopic aperture, photographic exposure length and even sky clarity) is irrelevant if you want to produce colorful, naturally hued, high contrast deep images of heavens.

Remote link

Operating a remote observatory is similar to using a back garden, computer controlled telescope with a few significant differences. For example, my telescope is controlled by a standard off-the-shelf computer located inside the observatory and accessible from the Internet. The telescope mount, camera, filter wheel, guider, instrument rotator, focuser and dome are connected to this computer using USB cables. A small movable IP camera faces the telescope and provides a live view of what's happening under the dome. Local weather conditions are obtained from the national weather service, satellite data, an electronic weather station mounted outside the building and a light-sensitive all-sky camera that's useful to spot rapidly changing sky conditions immediately overhead. Thus, accessing the remote computer's desktop provides much of the same control as if I were physically seated alongside my instruments.

Any back garden astro-photographer can walk over, extend their hands and adjust their instruments when needed, and cover or move their telescope inside should the weather suddenly turn inclement. This is not possible when your equipment is located hundreds or thousands of miles in the distance.

▲ **Jay GaBany at work on his home computer, using the interface that controls the telescope from the comfort of his study.**

So, even small situations mushroom into a crisis quickly. For example, local observatory power failures, the loss of Internet connectivity or a dome that refuses to close can lead to catastrophic conditions if the weather turns bad. Therefore, it's vital to have a ground crew nearby who's willing to provide 24/7 assistance at a moment's notice because a remote observatory might as well be located on the far side of the Moon if something unexpected breaks. Fortunately, I've received consistently responsive local support.

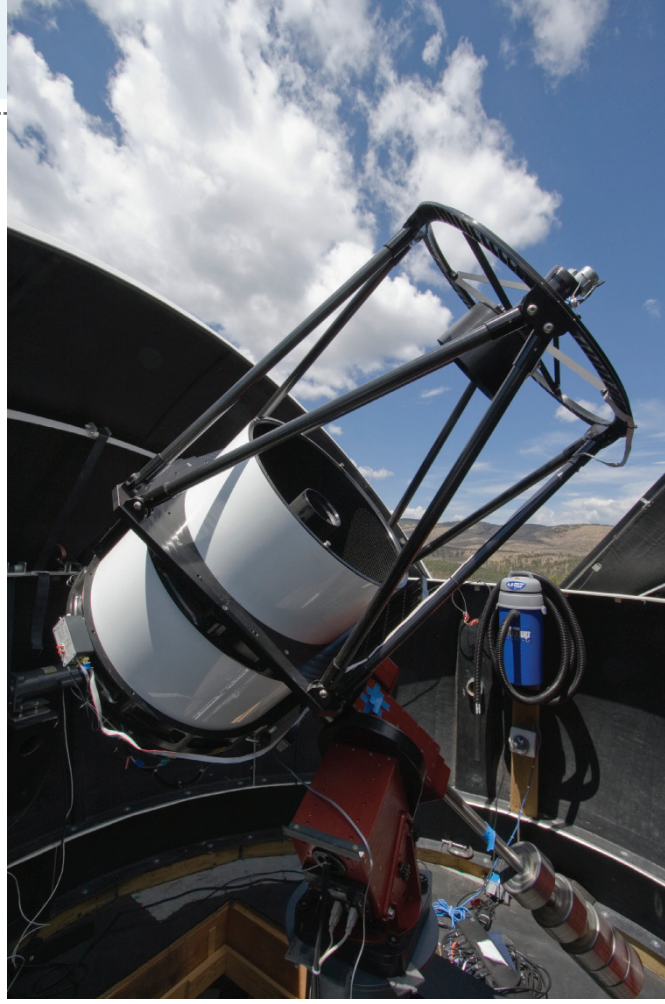
Robotic observatory

There are several applications on the market that literally turn a telescope into a robot. These powerful, clever tools enable the astrophotographer to script the complex steps required to obtain deep exposures. Their execution also permits the user to grab a good night's sleep confident their observatory will automatically close and protect their valuable equipment if the weather turns unexpectedly for the worse. I've used these solutions on several occasions but still prefer to remain awake and review each exposure as it downloads from the camera. I miss being able to stand by my telescope at night, gaze up and view the same sky that rivets its attention. While it's infinitely more convenient to expose images from the comfort of a warm home office, I admit my connection to the night sky has weakened over time. So, monitoring the camera's progress is one way I compensate and retain a smidgeon of that old romance with the stars.

At the end of a night's session, each exposure is downloaded and re-inspected. Since many of my imaging projects encompass multiple days or weeks it may be months before I commence my post-production processing. Working with extremely long exposure times enables the surfacing of extremely faint features with a minimum of noise. Since all of my projects are produced unbinned, the color exposures permit me to reveal small often overlooked structures, too. Typically, I'll spend several hundred hours processing the data my camera has gathered and often start from scratch at least once or twice before reaching an acceptable conclusion.

The effort I invest often produces results wholly unexpected and occasionally surprising, even to me. However, I enjoy the hours spent in post-production because it allows me to explore the places my camera has captured as if I were actually there. Unfortunately, the stars will remain physically beyond our grasp until long into the far future. So, until our forebears consider Orion the best place to spend their next vacation, astronomical images are the closest we will get.

The past few years have been quite a personal journey from my initial light saturated back garden imaging attempts. However, there are many others who have traveled a similar path to the stars and I suspect, over time as the night sky continues to brighten, many more will follow.



▲ **The interior of Blackbird Observatory, with the 0.5-metre (20-inch) Ritchey–Chrétien that was manufactured by RC Optical Systems. It is mounted on a Paramount ME. Prior to 2010 Jay used an 11 megapixel SBIG STL-11000M CCD, but this has now been superceded in his observatory by a 16 megapixel Apogee Alta U16M-HC.**

For more relating to remote-controlled observatories, see *Telescope talk* this month on pages 82–85.

R Jay GaBany is an astrophotographer living in California. His first remote observatory, the Blackbird Observatory, was located in the mountains of New Mexico. His new observatory, Blackbird Observatory 2, is relocated in California's Sierra Mountains. You can experience his wonderful astrophotography at www.cosmotography.com.

▼ **The lovely spiral galaxy M106 in Canes Venatici, imaged by the R Jay GaBany. The red 'arms' sprouting from the galaxy's core are caused by jets emanating from the supermassive black hole at its centre and shocking the surrounding gas. The image was captured over a total exposure time of 37-hours between April and June 2010.**