

## ASTRONOMY

### Steady setup, long exposures key to clear astrophotography

Tuesday, April 25, 2006

TOM STATLER

The spectacular images of the deep reaches of the universe are everywhere these days, from posters to postage stamps. Nearly everyone has some personal favorite view of space that they find inspiring: maybe the rings of Saturn, or a view of a wispy interstellar nebula.

It's tempting to imagine that, with huge telescopes all over the world and in orbit around Earth, astronomers ought to have an easy time getting these pictures. But it's a lot harder than it sounds.

For one thing, it's dark out there. There are hundreds of billions of stars in a typical galaxy such as our Milky Way, and they are spread so far apart that there just isn't enough light for a quick snapshot. Long exposures are the name of the game, and the deeper you want to look, the longer you have to go.

This presents a problem if your telescope is on Earth because our planet is spinning. Your telescope needs to turn in the opposite direction, along an axis exactly parallel to the Earth's axis. If not, your photo will be nothing but a blur. The telescope must stay pointed at exactly the right position in the sky without the slightest wobble.

Amateur astrophotographers know that to get a sharp image, an Earthbased telescope must stay locked on target with an accuracy better than one second of arc. That means that if your telescope is 1 meter long, it can jiggle no more than 5 microns, less than one-tenth the width of a human hair.

Modern telescopes actually look at two things at once: the target of the observation and a relatively bright star nearby. If you continually adjust the telescope to keep the image of the guide star steady, your long exposure will come out clear and crisp.

Nowadays, a computer does this for you. Early in the 20<sup>th</sup> century, astronomers had to spend countless hours peering through eyepieces at guide stars.

Orbiting telescopes such as the Hubble and its successor, the James Webb, also rely on computers. The Webb is being designed to point a thousand times more precisely than an average ground-based telescope.

Telescopes at major mountaintop observatories are being equipped with lasers to produce artificial guide stars in the upper atmosphere. These will help them point almost as accurately as the Hubble and Webb.

Tom Statler is director of the Astrophysical Institute at Ohio University in Athens.

**statler@ohio.edu**

