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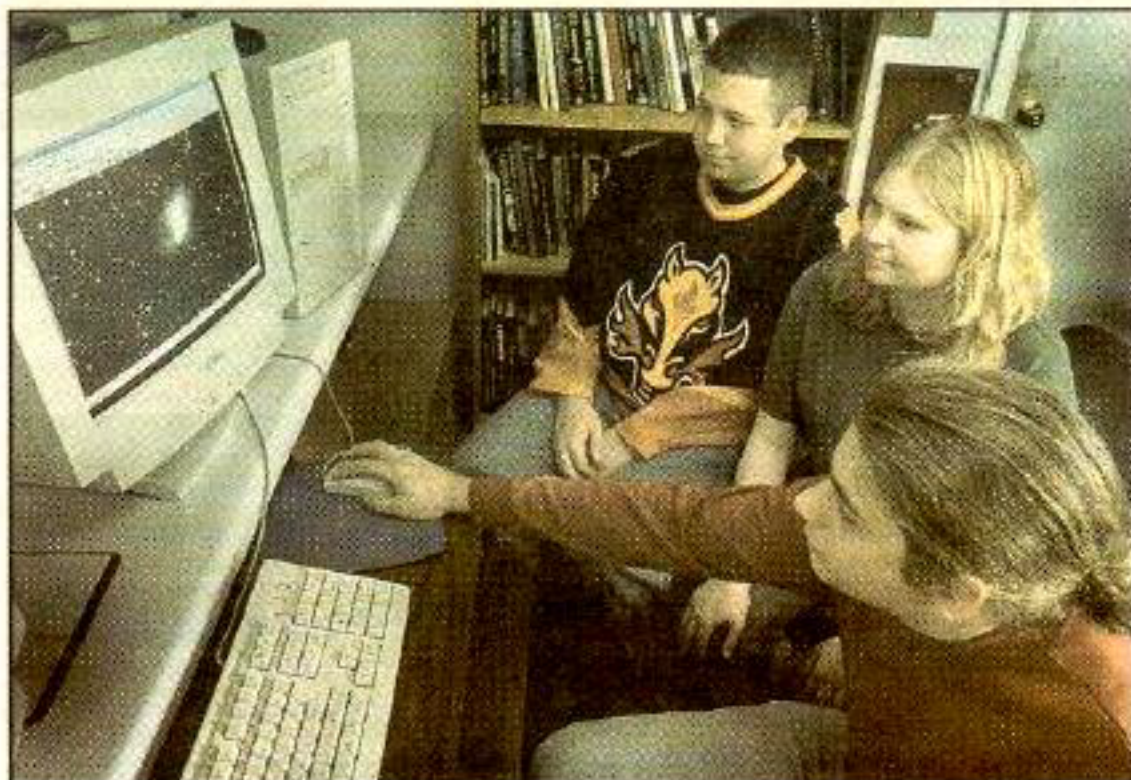
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Eyes on the skies

Virginia Tech students are assembling color photos of stars and galaxies, using telescopes, computers and their passion for astronomy / Page 14



The Crab Nebula is an expanding cloud of debris created when a star exploded. The nebula, about 6,500 light years from Earth, is about 8.5 light years in diameter. Chinese and American Indian astronomers recorded the first sightings of the Crab Nebula in 1054. This color picture was created by Virginia Tech students James Roberts and Lisa Francis.

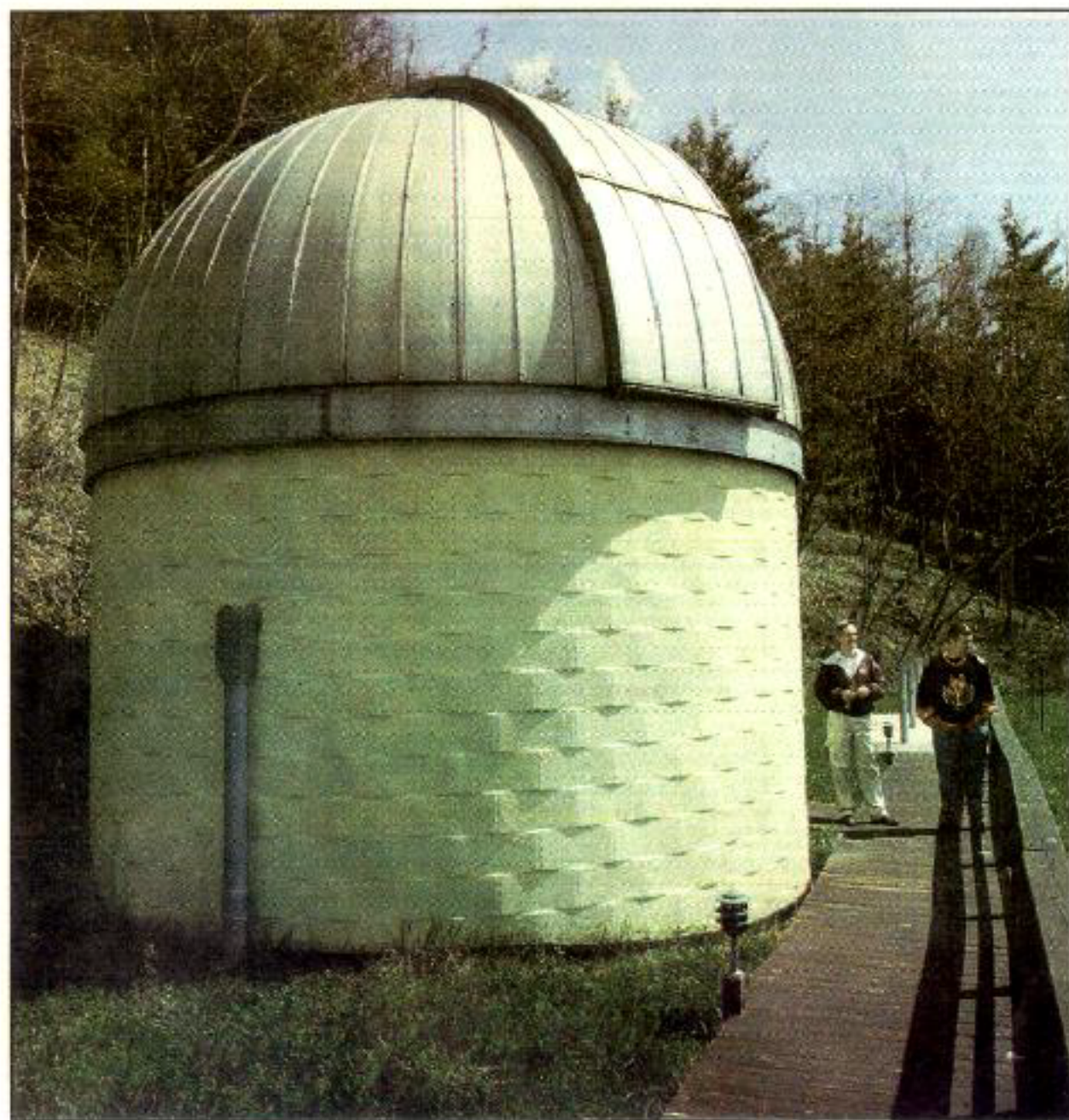


GENE DALTON / THE ROANOKE TIMES

As part of their Observational Astrophysics class, James Roberts (front), Lisa Francis and Mike Lyons are among a group of Virginia Tech students who are assembling slick, professional-looking color images of distant stars and galaxies.

'You can't see anything like this on Earth'

The colors of the universe



GENE DALTON / THE ROANOKE TIMES

Virginia Tech professor John Simonetti and student Mike Lyons stand outside the Flossy Martin Observatory, which is part of the Miles C. Horton Sr. Research Center, a complex donated to Tech by tobacco fortune heir Miles Horton Jr.

Virginia Tech students are assembling color photos of stars and galaxies, using telescopes, computers and their passion for astronomy

By MIKE GANGLOFF

THE ROANOKE TIMES

MOUNTAIN LAKE — People hike Salt Pond Mountain for the views of ridge lines blurring into West Virginia. But it's the sights at night that attract Lisa Francis, James Roberts and Mike Lyons to Giles County — the sights few people ever see.

The three Virginia Tech students usually drive out from Blacksburg long after dark, when the peaks are hidden but the heavens are open to be explored. At the Flossy Martin Observatory, using sophisticated computer gear and an arrangement of mirrors that Isaac Newton designed, they may spend hours collecting even a single image too faint for the naked eye to detect.

"You can't see anything like this on Earth," Lyons enthused.

Francis, Roberts and Lyons are among a group of students who are assembling color pictures of distant stars and galaxies: slick, professional-looking images like the ones in science textbooks. The laborious undertaking is a project for their Observational Astrophysics class, a course that involves everything from tracking asteroids to learning when the moon clears

the trees. But the work also stems from a passion the students say has lasted for years.

Roberts, a 22-year-old from Chantilly, can't remember a time when he wasn't fascinated with the night sky. Majoring in physics at Tech — the university offers only a minor in astronomy — he plans to start a combination master's and doctoral program in astronomy next year at the University of Colorado.



The M81 galaxy is 12 million light years from Earth, encompasses 100 billion stars and is about the same size as our Milky Way galaxy. Virginia Tech students Mike Lyons, Joe Chin, Josh King and Jon Harris created the picture through a series of long-exposure images.

Lyons, 20, recalled that as a child in Norfolk, he would wake up to see lunar eclipses. His father gave him a telescope "but we never could get that to work," he said, laughing.

Francis added, "When most little kids were telling their Mom and Dad they wanted to be firefighters, I was telling my Mom and Dad I wanted to be an astronomer."

Now 22, the Annandale native laughs as she describes how when she came to college, she majored in art. But her astronomy dreams persisted, sometimes emerging in the Neptunian landscapes of her drawings and

sometimes in projects like she is doing now with the space images.

"It's just like art, it really is," Francis said of the astronomy class.

The scientific side of the students' work is readily apparent at the observatory. Dedicated in 1991, it is part of the Miles C. Horton Sr. Research Center, a complex donated to Tech by tobacco fortune heir Miles Horton Jr. The observatory is one of several facilities Horton named after Flossy Martin, a high school teacher whom he credited with inspiring his lifelong interest in science.

A simple-looking telescope,

really just two mirrors and a framework, sits atop a concrete pillar that extends 10 feet or so into the ground. The heavy base is isolated from the rest of the building — the floor is cut out around it — to prevent vibrations from shaking the instrument.

The students are using a 0.4-meter telescope. The size refers to the diameter of its light-gathering parabolic mirror. The largest optical telescopes are the twin 10-meter Keck Telescopes in Hawaii.

The telescope peers through a slit in the 16-foot diameter dome that tops the observatory and is rotated by computer-

controlled motors to offset the Earth's rotation.

The computer, in a nearby control building, also must correct for the slight flexing of the telescope's metal framework as it pivots to various positions. These are tiny movements, but enough to spoil the telescope's aim across such vast distances, explained professor John Simonetti, who teaches the astronomy class.

The artistic element Francis mentioned comes into play as the students put color to their pictures. It's an open question what distant stars really look like.

The human eye sees far-off space in shades of gray. That's because the eye captures just a small fraction of the light that hits it, not enough to assign color to the dim images that even a powerful telescope reveals.

Color photography, which used to be used in observatories, also has problems with color balance and resolution, Simonetti said.

The computer chip mounted on the observatory's telescope is much more sensitive, but it operates only in narrow frequency bands, leaving any single image essentially a two-tone portrait.

Stars

"It's hard to know how your eye would respond" if such far-off objects could be seen up close, Simonetti said.

The students build their pictures by combining three long-exposure images of the sky.

For a picture of the M81 spiral galaxy (the number refers to a catalog of celestial objects assembled by 18th-century French astronomer Charles Messier) Lyons and his teammates took an eight-minute exposure around the red end of the visible spectrum, a 15-minute exposure for greens and a 20-minute exposure for blues. Including set-up times, the process took well over four hours, Lyons said.

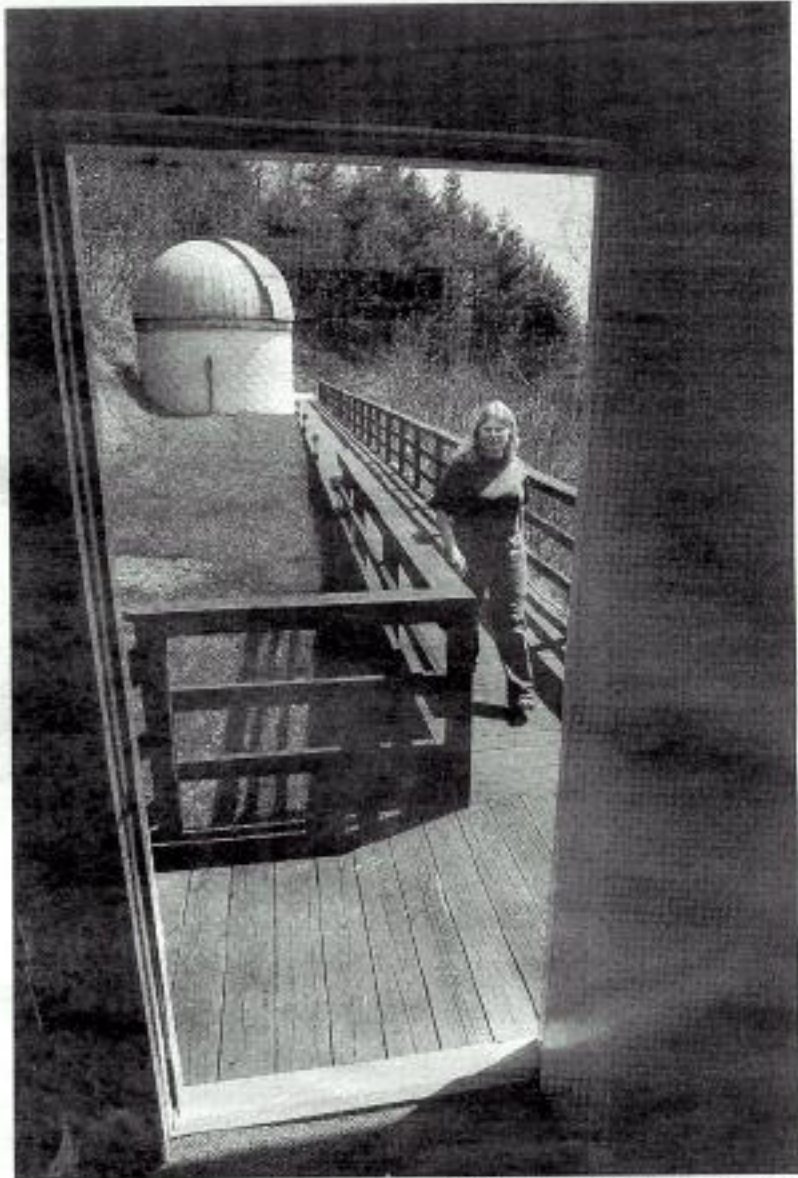
Francis and Roberts took 4½ hours to build a picture of the Crab Nebula.

A full-color picture is created when the three images are combined, and the students adjust the color balance until it seems right.

"You try to do it as scientifically as possible and then you just try to make it look good," Roberts said.

They're quick to point out that their pictures are as realistic as they can make them, and Simonetti agrees the pictures are less fanciful than some colorized photos released by scientists at the National Aeronautics and Space Administration.

In the end, though, the students said they draw satisfaction



GENE DALTON / THE ROANOKE TIMES

Lisa Francis walks from the Flossy Martin Observatory to the control room where a computer monitors the telescope and makes corrections in its movement. The movements are tiny, but enough to spoil the telescope's aim across such vast distances.

as much from the process as from the finished results.

"For me, astronomy's always been looking for things I've seen in books and seeing what they look like for myself," Lyons said. "Anybody can take a

camera and go out and take pictures of things on Earth."

On the Web:
www.phys.vt.edu/~jhs/phys3154

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