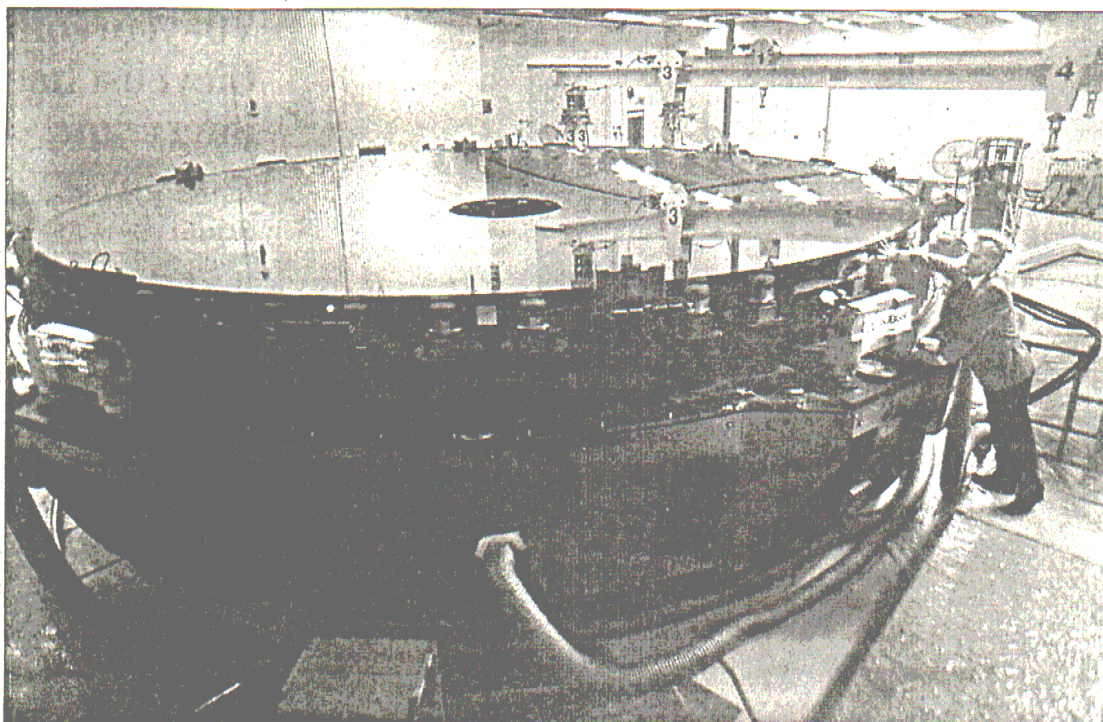


## STATE / REGION



Dr. Scott Smith examines the world's largest one-piece mirror — it has a 27-foot diameter — in a cavernous limestone mine in Lawrence County.

John Beale/Post-Gazette

## Hawaii trip soon for huge telescope mirror

MIRROR FROM PAGE B-1

The telescope will gather information from 15 billion light-years away. The farther something is away from us in the cosmos, the older it is and the longer it takes for its light to reach us. The most distant object detected by any telescope is 14.3 billion light-years away.

The National Astronomical Observatory of Japan just accepted the 27-foot diameter mirror. Contraves Brashear Systems of Pittsburgh painstakingly polished nine tons of glass off the original 33-ton chunk down to a precision of five-billionths of an inch.

That is so near perfect that if the mirror were blown up 10 thousand times, to 51 miles' diameter, it would have a surface error of 0.005 inch.

Masanori Iye, a Japanese project scientist who oversees the work, called the production of the mirror "a tremendous achievement."

"I'm very happy with this fine accomplishment. We have been working since 1984 [on the telescope], so it's almost 15 years now," he said. "I'm very excited. We have been just waiting for the completion."

Japanese scientists expect to take their first gander at the universe through the telescope in January. To Iye, that seems so soon after so long.

*"I'm very happy with this fine accomplishment. We have been working since 1984, so it's almost 15 years now."*

Masanori Iye, project scientist

Sometime in the next two weeks, a special truck carrying the mirror will crawl down the highway to Pittsburgh, producing a megajam in traffic, as it did when it arrived four years ago from Erie.

The mirror must be shipped with great care because it can't undergo the slightest warping. Despite that, it was ground here rather than in Hawaii because Pittsburgh-based Contraves got the bid.

The only indication of the mirror lab 40 miles northwest of Pittsburgh is a generic sign on the edge of a cornfield on Route 18. The sign, which says only "Gateway Commerce Center," is across the highway from the short road to the former mine in Wampum.

In the mine, where donkeys used to lug out carts of chalky limestone, the temperature drops to a cool 55 degrees. The mine is well lit and bright with white paint sealing

the limestone walls. Workers' cars line the walls on the mine's paved floors.

Contraves chose the cavernous limestone mine because it maintains a constant temperature of 55 to 56 degrees and there are no vibrations. The constant temperature and vast space have drawn other companies.

The mirror shares space in the mine with stored collector's cars and sailboats, Elizabeth Taylor and Elvis Presley. 20th Century Fox stores the negatives of more than 500 movies and TV series in a vault.

Inside the white cement block and limestone offices of Contraves, the last room holds The Mirror.

From the floor, it appears to be an aqua-colored above-ground swimming pool with a bunch of giant black Thermoses on top. From above, the mirror is a shimmering curved lens that could be a contact

lens for Godzilla.

A profusion of hand-sized, round objects — 261 of them — show through the eight-inch lens. Each computer-controlled actuator, as they are called, will independently counteract the forces of wind and gravity on that small section of the mirror that would distort its shape.

Boring holes for and installing the actuators took most of the time since the plate of glass arrived four years ago. Then the opticians spent 18 months grinding and polishing the mirror. They started with grit and grinders 10 feet across, and worked their way down to a slurry of fine diamond grit and polishers 6 inches across. For the final buff, opticians walked across the glass in their socks and polished it by hand.

With the Japanese approval of the mirror's precision, the big glass will soon be lowered into a crate that took nine months to build. The mirror will be trucked down the highway to the Ohio River. Then it will float down to New Orleans and around to Hawaii, where it will labor up the 2.5-mile mountain road on a truck with 12 axles and 48 wheels.

Pure aluminum will be applied to the surface of the mirror in Hawaii to make it highly reflective.

In January, the Subaru Telescope will catch its first light, beginning its contribution to our understanding of the structure and evolution of the universe.

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## 24-ton telescope mirror set for transit

By Sharon Voas

Post-Gazette Staff Writer

One hundred ten feet below the ground at an inconspicuous spot in Lawrence County is a chunk of glass shaved smoother than silk that cost about as much as PNC Park.

The precisely polished glass in a cool limestone mine is the mirror for a telescope that will collect light from nearly the edge of the universe. The telescope will peer so far back in time that it will let us see back almost to the Big Bang itself.

A Pittsburgh optical company just finished buffing the mirror with polishers custom built in Germany for a Japanese government telescope in Hawaii.

Everything about the mirror seems to involve astonishingly large or infinitesimally small numbers.

The world's largest one-piece mirror is the most expensive part of the \$250 million Subaru Telescope under construction on the 14,000-foot summit of Mauna Kea in Hawaii. That puts its cost somewhere in the same ballpark as the Pirates' proposed \$228 million home.

The Subaru Telescope — named after a constellation, not a car — will be one of the most powerful on Earth. It will allow us to learn more about the origin of the universe because it will see back almost 15 billion years, assuming that this is the age of the universe.

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Tony Norman's column will resume Tuesday.