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MEGASCOPE

STARS

By Marcia Bartusiak

The scene is a familiar one: a line of radio telescopes stretching to the horizon, with the miles-long network acting as one giant eye on the universe. Radio astronomy's premier instrument is the Very Large Array in New Mexico. Together its 27 dishes have the resolving power of a single dish 17 miles in diameter. Until recently such a sight was the exclusive domain of radio astronomy. But by the twenty-first century optical astronomers could have their own version of a megascope on the mountaintops of the American Southwest.

With the cost of optical telescopes plummeting, it is conceivable that multi-telescope arrangements will become more common at optical observatories. "It's an idea that people have had in the back of their minds for a very long time," says University of Minnesota astronomer Roberta Humphreys. "But the technology was just not there—until now."

Explains Humphreys's colleague, infrared astronomer Terry Jones: "Telescope designers are beginning to offer optical telescopes that are lighter, use less metal, and are easier to put together." For these reasons astronomers can now order a batch of telescopes without a loan from Fort Knox.

Almost by accident the two Minnesota astronomers found themselves spearheading a movement to establish the first multiscope facility in the United States. Because available time on the world's largest and best optical telescopes is a precious commodity, the astronomy department at the University of Minnesota hoped to convince two or three other U.S. universities to join in erecting a single 3.5-meter optical/infrared telescope on an appropriately dark mountaintop somewhere in the Southwest. "To our surprise, more than a dozen universities expressed interest," Humphreys says. "From that response we knew we weren't talking about one telescope, but several."

According to Humphreys and Jones, a consortium of astronomy departments from universities across the country envisions a cluster of three or four telescopes on an Arizona or New Mexico

mountaintop. Spaced about 50 to 100 yards apart, all will be coordinated by a computer at a central operations center.

With the multiple array, each telescope could be equipped with a different detector—an infrared spectrometer on one, an optical photometer on another, for example—and could accomplish an across-the-spectrum observation of a sky object in one night. With observing time doled out so sparingly, it now takes three or four separate runs with a single telescope and up to two years to accomplish the same task.

The multiple array eliminates other problems. "Astronomers are always trying to take the observations made at one observatory and compare them with data gathered at a different time with a different instrument. But the celestial object under study is likely to have changed between observations," Jones says. And trying to get two observatories to look at the same thing at the same time can be an administrative nightmare.

Being able to make simultaneous observations is particularly suited to

celestial objects that change dramatically over days or weeks. Such a telescope, for instance, could help astronomers decide whether quasars—the brilliant cores of newborn galaxies—are truly powered by black holes, which, theorists say, intermittently gobble up matter and spew out fountains of electromagnetic energy. "Dwarf novae—binary star systems where mass is being transferred from one star to another—are also leading candidates," says Jones.

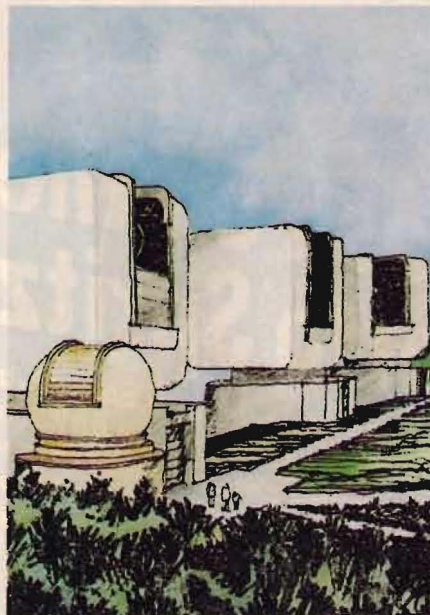
"Somehow energy is built up during the transformation and is periodically released in a tremendous explosion." The multiple-mirror telescope will allow astronomers to observe these transformations by examining different parts of the electromagnetic spectrum simultaneously.

"With identical detectors on the four 3.5-meter telescopes," Humphreys adds, "we could also turn the array into the equivalent of a giant seven-meter telescope in terms of the amount of light that is collected."

In a decade or so it might even be possible to connect the telescopes with either fiberoptics or a series of mirrors and to operate the entire array as a giant interferometer. By comparing the light waves received by each telescope, astronomers could deduce the sizes of both stars and quasars.

Right now the multiple-mirror telescope is just an idea, but Humphreys and Jones hope to convince some starstruck millionaire that their proposal is a bargain. And at \$20 million to \$25 million, it would be. The consortium would be building three or four telescopes for roughly the same price that one giant telescope would have cost a decade ago. Once funded, the array would join an ongoing renaissance of new optical-telescope construction that includes the Hubble Space Telescope and the ten-meter Keck Telescope atop the extinct Mauna Kea volcano in Hawaii.

The project is known only by the matter-of-fact name Multiple Telescope Observatory. "But whoever comes up with the most money," says Jones, "will probably be able to call it anything he wants." ☐



A bunch of telescopes at bargain rates.