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science spectrum

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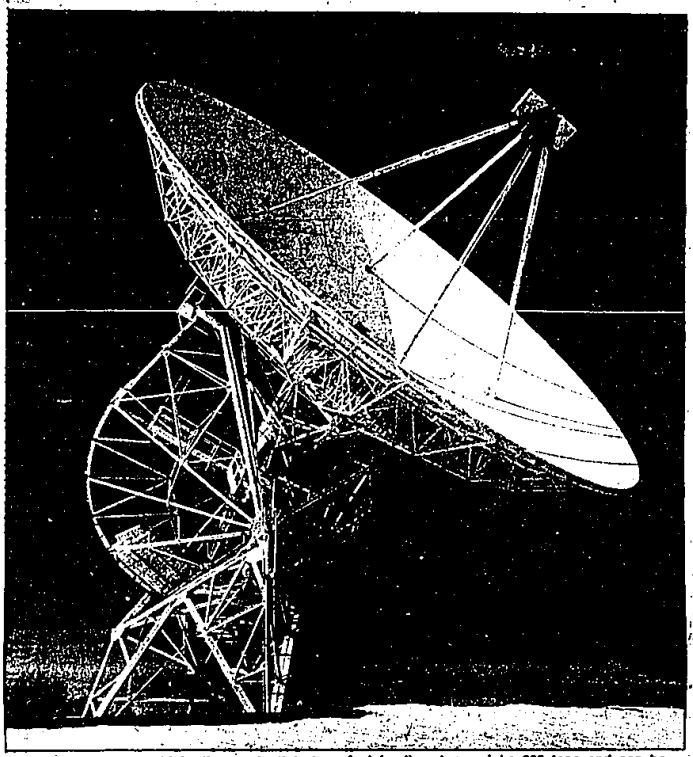
Listening to the stars

U of M scientists use radio telescope to explore the heavens



The radio telescope, which allows scientists to listen to signals emitted from outer space, is 85 feet in diameter, weighs 200 tons and can be steered toward any part of the sky.

By Steve Barnaby
editor

George Lathimer has been with the behemoth since the beginning.

He's the only "original" still with the 200-ton listening device built in 1958.

Contentedly, he admires the noble *beast as it defies its own size and effortlessly* swings to and fro, seeking out sounds from millions of light years away. Only the purr of the 20-horsepower motor breaks the silence of the surrounding woodland.

The target of his admiration is the Peach Mountain Radio Telescope. Hidden away on a 1,050-foot-high mountain reserve 15 miles northwest of Ann Arbor, the giant disk is the only device of its kind in Michigan which seeks out the secrets of the universe.

"I'VE SPENT a lot of hours alone with it up here," said the technical services superintendent, looking up at the giant disk. "For years, you know, it sunk. We had to realign it each time because of its tremendous weight."

The 85-foot parabolic dish rests on an 800-ton base of concrete to steady it. Because of its size, it is balanced with 80 tons of lead.

Technically referred to as a telescope, in truth it is more like an incredibly large electronic ear. Unlike the more common optical telescopes through which a person sees the faraway stars, planets and galaxies, the radio telescope hears what cannot be seen.

IMAGINE FOR a moment that human beings could see what radio waves transmit. Suddenly our familiar solar system becomes an unfamiliar sight. Jupiter would loom as the brightest of the planets as electrical storms burst from it. Other planets would be nearly invisible. The sun would be much dimmer, the Milky Way, much brighter.

For the radio telescope looks through a different "window" than that of the more familiar optical telescope, according to Hugh Aller, University of Michigan professor of astronomy.

"We are getting a different picture of the universe. Weather pretty much doesn't interfere with us. We can peek through the clouds," said Aller, who has been on the U-M faculty since 1958 and is one of the main users of the radio telescope.

THE FIRST view of the radio universe was seen in 1932 by Karl Jansky, an engineer working with the Bell Laboratories. His radio telescope consisted of an aeriel mounted on a pair of car wheels.

The purpose of his work was to see how a new short-wave receiver reacted to atmospheric noise. When pointing his device toward the Milky Way, he found a consistent hissing sound — radiation originating in that galaxy. Radio astronomy was born.

Scientifically, radio astronomers are observing one portion of the electromagnetic spectrum while optical astronomers are observing another. What the radio telescope "sees" are emissions of mostly hydrogen gases which are unable to be picked up on the visible portion of the spectrum. In short, you may be unable to see these objects, but you can hear them.

AND WHAT the radio astronomer is able to "see" is a universe unknown to most of us. The faraway Milky Way is just the beginning. Beyond that are what have been termed as "radio" stars — objects emitting intense radio radiation. These are often what are called supernovae — extremely bright stars which suddenly increase 10 million to 100 million times in brightness — a dramatic last flicker before death.

At the Peach Mountain facility research has been concentrated on quasars — celestial objects which emit more energy than our entire galaxy.

"They are the most distant objects we know about," Aller said. They also are the objects which could uncover the secrets of our own solar system's genesis.

RADIO TELESCOPES are capable of detecting objects in the far reaches of the universe which some scientists believe were caused from an imploding galaxy — matter which collapses inwards and spews out residue. Therefore, a radio star 1,000 million light years away belongs to a much younger universe.

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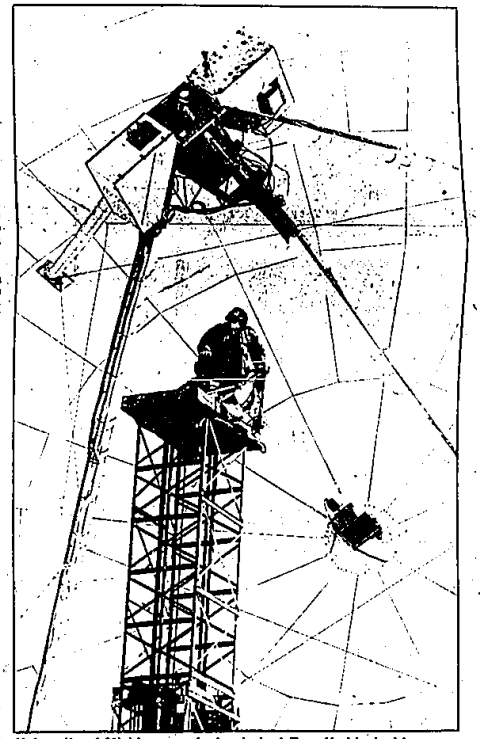

University of Michigan graduate student Tom Haddock rides an elevator to reach the feed horn assembly at the focal point of the telescope.

Want a radio 'scope? Here's how to build it

With a little ingenuity, the interested amateur astronmer can have a set up which will put him into radio contact with the outer reaches.

Tom Haddock checks on incoming signals from a Cepheid galaxy located more than 1 billion light-years from Earth.

Here is how you do it:

There are two components to the home radio observatory: the receiver and the antenna. Any shortwave receiver that is capable of tuning the 20 to 25 MHz portion of the radio band will do. It should also have a provision for attaching RG⅝u coaxial cable to the antenna input.

The antenna is constructed of easy-to-find materials and a minimum of carpentry skills are needed to put it together. Here are the materials you'll need:

- A five-foot square of ¼-inch plywood. The lumber company will cut it to size for you.
- A piece of ordinary metal (not Fiberglass) window screen, five feet square.
- Three, eight foot lengths of of 1x2-inch boards.
- Twenty one feet of general purpose wire (10 gauge should work well).
- Five to 10 feet of RG⅝u coaxial cable. Easily purchased at any electronics store.
- Soldering iron and solder.

The window screen is attached to one surface of the plywood. This will be the radio wave reflector. Cut four, five foot lengths of 1x2s and assemble them like a frame. The 1x2s are used to make legs for the frames. Each leg should be two feet long and attached to the corners of the frame. The frame should resemble a five foot square table without a top. Now attach the legs of the frame to the plywood base. Make sure that the screen side of the plywood is facing up. Now the 20-gauge wire is attached to the top of the frame. This wire will collect the radio signals that have bounced up from the window screen. The wire should run around the entire perimeter of the frame.

The wire must be attached to the receiver. This is where the RG⅝u comes into play. The two free ends of the wire are soldered to the cable. The coax then is attached to the shortwave receiver.

Tune the receiver to the 20-25MHz portion of the radio band. With a little skill you'll receive Jupiter.

Supervisor of technical services George Lathimer (left) and Tom Haddock check a new computer program in the control center.