RADIO ASTRONOMY

Largest U. S. Radio Telescope

Financed by the National Science Foundation, this powerful radio telescope will assist U. S. scientists in their bid for leadership in the field of radio astronomy.

By ANN EWING

➤ THE NEWEST LISTENING POST in the United States to tune in on the radio waves being broadcast by the other planets and the sun as well as far-distant objects will soon be under construction in a remote mountain valley near Green Bank, W. Va.

With this 140-foot, dish-shaped antenna to catch radio radiation from vast regions of space beyond the power of present instruments, U. S. scientists will make a strong bid for leadership in the newest field of astronomical research, listening to radio broadcasts from the heavens. These celestial broadcasts are picked up on receivers much like those used for television, but 100,000 times more sensitive.

Although an American discovered 25 years ago that the sky is hissing at us, the British, Dutch and Australians have since out-distanced this country in studying these cosmic noises.

The receiving power of the 140-foot "saucer," as well as of other radio telescopes, may be increased 100 times through use of a new, low-temperature device now being developed. Known as the solid-state maser, the device would amplify the very faint signals received from space, allowing the radio telescope to "see" ten times farther than without it.

With or without this attachment, the giant antenna, financed by the National Science Foundation, will give scientists a powerful tool for examining the universe at radio wavelengths.

Strange Constellations

If eyes were sensitive to radio waves instead of to light, the heavens would appear strangely different. None of the familiar stars of the night sky would be observable. In their places would be many radio sources forming totally unfamiliar constellations.

About a dozen of these sources have been identified with faint objects seen telescopically, but many hundreds of the 2,000 now known have not. Even the objects detected both by radio and optical telescopes appear to have different sizes and shapes in each.

This is the broad picture over the entire celestial radio "window," which ranges from wavelengths of a few miles for low frequencies down to about an eighth of an inch for extremely high frequency microwaves, much wider than the range available using light alone.

Within this radio spectrum lies a particularly interesting region where the 140-foot antenna is expected to be tuned in extensively. This is at 1,420 megacycles, the frequency emitted by the unseen atoms of hydrogen in interstellar space.

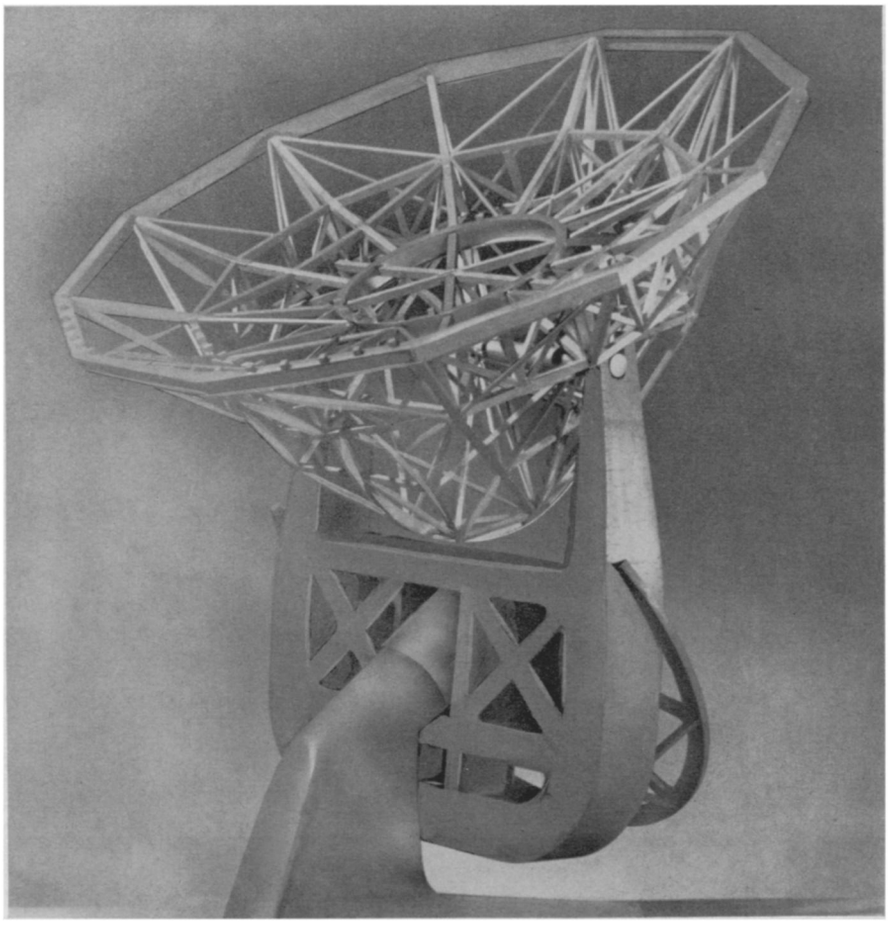
The hydrogen line broadcasts were discovered in the United States in 1951, and shortly thereafter confirmed by the Dutch and Australians. Although only this one line has so far been discovered, the Green Bank instrument is sure to look for three others at other frequencies: deuterium, or heavy hydrogen; the hydroxyl group, OH; and the carbon-hydrogen radical, CH.

Extensive surveys have shown the hydrogen radiating at 1,420 megacycles is concentrated within the spiral arms of our galaxy, and these arms have now been traced out in some detail. Tuning in on the eight-inch radio waves from hydrogen in the space between the stars opened up portions of the Milky Way closed to optical astronomers because of vast gas and dust clouds. The Milky Way is the great stellar pinwheel of billions of stars in which the sun and its planets, including the earth, are only an insignificant dot.

The hydrogen radiation has also been detected from other galaxies, giant clusters of billions of stars lying far beyond the Milky Way.

Since the 140-foot radio telescope can gather radiation from considerably farther away than can present instruments, it will be aimed at galaxies more distant than those so far found. The object would be to confirm the apparent expansion of the universe.

About as far as the giant 200-inch telescope atop Mt. Palomar in California can



MODEL OF 140-FOOT RADIO TELESCOPE—Developed by Prof. Ned L. Ashton of Iowa City, Iowa, the large yoke is mounted on the polar axis parallel to the earth's axis. At the upper ends of the yoke's arms is a declination axis on which the dish-shaped antenna is mounted.

reach, some two billion light years into space, the universe appears to be flying apart at a rate that increases directly with distance. This apparent expansion is detected and measured by the reddening of light from far-distant galaxies, the so-called red shift.

As in the case of sound and light waves, radio waves have a higher frequency when the source is approaching and a lower frequency when it is receding. By measuring the amount of this shift, the velocity of the radio source can be found.

Research Planned

Two distinct studies of the hydrogen line have confirmed the apparent expansion of the universe at distances of 75,000,000 and 100,000,000 light years. A light year is the distance light travels in one year at 186,000 miles per second.

Since the 200-inch can see some two billion light years, scientists would be more confident they are dealing with true expansion effects and not some change in fundamental laws with distance if the correspondence of both light and radio effects could be confirmed by radio waves from sources considerably beyond those now measured.

The structure of the Milky Way, the search for unseen elements between the stars and the apparent expansion of the universe are only a few of the many problems scientists hope to resolve using the Green Bank instrument. Although smaller than its 250-foot counterpart being constructed by the British at Jodrell Bank in England, it will have an exceptionally high precision.

Congress has appropriated approximately $4,000,000 for purchasing the land, constructing the telescope and building other necessary facilities. Associated Universities, Inc., New York, will manage activities at the installation since the National Science Foundation is forbidden by law from engaging directly in research.

Facilities for Teaching

Facilities of the national radio astronomy observatory at Green Bank will be available for research to radio astronomers from the entire country. The site was selected over 29 other locations because radio noise there is at a minimum, the high mountains acting as a shield against much of the undesirable radio noise.

The equipment at Green Bank will also be available for training graduate students in radio astronomy, the science in which astronomy and electronics are merged. Although this new science is 25 years old, its real significance as a tool for exploring the universe was not fully realized until after World War II.

The radio sky was first glimpsed in 1932 by Karl Jansky, an engineer at Bell Telephone Laboratories. In the last ten years, one discovery has followed another with bewildering speed. Larger and more sensitive receivers are being constructed in many countries, including the Soviet Union, to pick up the very faint radio signals from space.

The sun, a powerful emitter of radio waves, is being extensively studied, as are the three planets so far detected by radio, Jupiter, Venus and Mars.

The second brightest radio source in the sky was found, after close cooperation between optical and radio astronomers, to be a most unusual event — two very distant galaxies in collision. The stars in each galaxy are much too far apart to smash into each other but the gas between the stars is set into violent motion by the collision. Highly turbulent gas radiates radio waves.

If the colliding galaxies were ten times more distant, they could not presently be observed even with the 200-inch Palomar telescope. As a radio object, they could, however still be detected by sensitive radio telescopes.

With the new instruments now coming into operation, scientists may thus be able to "see" far beyond the limits of visible space as they probe ever outward in their search for knowledge and understanding of the universe.

Science News Letter, May 4, 1957

BIOCHEMISTRY

Antibiotic to Protect Plant Crops Is Isolated

➤ FARMERS MAY soon have a new antibiotic to fight a variety of crop diseases. Called Duramycin, it has been found effective against several diseases afflicting beans, wheat and bluegrass.

Duramycin, named because of its ability to withstand heat, was isolated by U. S. Department of Agriculture researchers, Dr. Odette L. Shotwell of the USDA Northern Utilization Research Branch, Peoria, Ill., reported to the American Chemical Society meeting in Miami.

The antibiotic is extracted from a culture of antibiotic materials produced by a variant form of the organism *Streptomyces cinnamomeus,* the source of another antibiotic, Cinnamycin.

Co-researchers with Dr. Shotwell were Dr. Frank H. Stodola and Robert G. Dworschack, chemists, and Lloyd A. Lindenfelser and Dr. Thomas G. Pridham, bacteriologists, all of the Northern Utilization Research Branch, and William R. Michael of St. Louis University, St. Louis, Mo.

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● RADIO

Saturday, May 11, 1957, 1:45-2:00 p.m., EDT.

"Adventures in Science" with Watson Davis, director of Science Service, over the CBS Radio Network. Check your local CBS station.

Dr. F. W. King, director of service, Medical and Scientific Department, American Cancer Society, New York City, will discuss "The Fight Against Cancer."