

Fifty Years of Radio Astronomy

Professional astronomers and amateur radio operators commemorate five decades of listening to the sky

By VERN RIPORELLA

Astronomy, often called the oldest science, was without observing instruments for at least its first two millennia. Not until the early 17th century, when telescopes were first trained on the skies by Galileo and others, did astronomy go beyond what the scientist could see with his eye and reason with his wit. Nearly overnight, the "horizon" of man's optical universe extended five fold and the volume of his universe increased two orders of magnitude. Yet it would be two centuries before the vastness of the universe revealed by optical telescopes could be fully appreciated.

As is now well known, the universe is "bright" at many frequencies. Optical telescopes peer through only a relatively narrow "window" of the electromagnetic spectrum. Relatively recent observations additionally show strong galactic emissions of X-rays and gamma rays, while the new IRAS satellite (SN: 4/9/83, p. 230) charts in a dense energy spectrum at infrared wavelengths.

The existence of extraterrestrial radio emissions was suggested in 1894 by Sir Oliver Lodge of Great Britain, a mere six years after the discovery by Heinrich Hertz of radio waves. Lodge himself apparently attempted to measure these radio waves between 1897 and 1900, though there is no record of his success.

It would be a third of a century later and an ocean away that success would eventually come, opening a new window on the universe. Karl G. Jansky of Bell Telephone Laboratories was working to identify the various sources of interference to international radiotelephone circuits. Beginning in 1928, he had systematically identified numerous terrestrial sources, including local and distant thunderstorms as well as man-made interference. He was puzzled, however, by an omnipresent "hiss" at 20.53 megahertz, heard on his apparatus in a field in Holmdel, N.J. He soon learned that the source moved across the sky in a regular manner. A friend suggested he plot the position of the source against a star map. When he did, Jansky found that the source was at the center of the Milky Way. The year was 1932.

Jansky's landmark paper, "Electrical Disturbances Apparently of Extraterrestrial Origin," was presented to the International Scientific Union in Washington, D.C., on April 27, 1933. This event could be seen as the birth of the science of radio astronomy.

Strangely, however, neither Jansky nor the professional astronomy community would follow up on Jansky's discovery for

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more than a decade. Jansky himself would be reassigned to another project, although, in the words of his brother C. M. Jansky, also an eminent radio engineer, Karl "would have preferred to continue his work in radio astronomy."

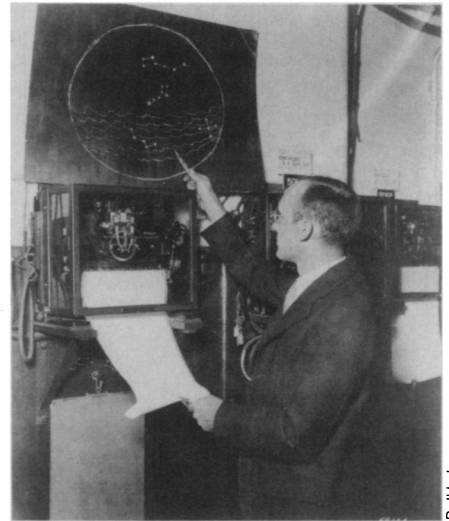
Finally, in Wheaton, Ill., a solitary individual plowed the furrow begun earlier by Jansky in an otherwise fallow field. Grote Reber, a radio engineer and amateur-radio "ham," read of Jansky's work and set out to refine his measurements as an adjunct to Reber's avid amateur-radio interests. He constructed an elaborate 10-meter (31-foot) parabolic reflector antenna in his yard, and with it did, in fact, improve on Jansky's results. Reber published a number of papers in this era describing the antenna and the signals he observed. His paper on "Cosmic Noise" appeared in the *ASTROPHYSICAL JOURNAL* in June 1940. Radio astronomy was on its way.

Now a group of astronomers at the National Radio Astronomy Observatory (NRAO) at Green Bank, W.Va., plan to commemorate Jansky's founding of the science of radio astronomy in a way certain to honor Reber's work as well. On two consecutive weekends in May, more than a dozen NRAO scientist-hams will be the focal point of a worldwide, on-the-air commemoration recalling the contributions of Jansky and Reber.

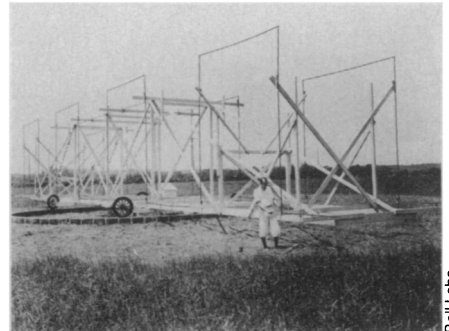
Using an exact replica of Jansky's original antenna on the 21 MHz amateur radio band, the NRAO scientist-hams will contact other amateur radio operators around the world who call in to the Green Bank station, callsign K8HUUH, on May 7 and 8. The replica of Jansky's original antenna, containing a few of the original parts, has stood at the entrance to NRAO since 1964. Nearby stands Reber's original 10-meter dish, moved there in 1958.

On the following weekend, May 14-15, the commemoration becomes more exotic. The NRAO scientist-hams will turn a 43-meter-diameter radio telescope toward the moon and listen on 432 MHz for the reflected signals of hams around the world. Although first accomplished in 1946 (at 111.51 MHz), the use of the difficult earth-moon-earth (EME) circuit for over-the-horizon UHF communications has remained a supreme challenge for the advanced radio amateur. New equipment and techniques are typically given their toughest tryouts on EME or "moon-bounce" experiments. The NRAO-Jansky commemoration aims to provide additional experiment time as well as the symbolism of the celebration itself.

One of the organizers at NRAO, Thomas A. Clark, himself a radio astronomer and ardent amateur radio operator with EME experience, points out another aspect of the occasion. "Amateurs," he says,



In this 1933 photo, Karl Jansky points to a spot on a sketch to indicate the region of the sky from which he first identified radio signals from space.



Jansky, shown in the 1930s with his rotatable 20 MHz antenna in Holmdel, N.J.

"may use the ... event to remember the birth of radio astronomy and to tune up their equipment for the birth of a new amateur radio satellite." Called OSCAR 10, this latest in the series of Orbiting Satellites for Communication by Amateur Radio (which began in 1961) is scheduled for launch in June by the European Ariane rocket. The NRAO transmissions reflecting from the moon will give hams a chance to check out antenna-pointing, signal-polarization and other details relevant to receiving messages relayed by OSCAR 10.

Fifty years ago Jansky stood by an ungainly array of pipes, wheels and gears. He accidentally discovered a new "window" on the universe, inaugurating a whole new science in the course of an otherwise routine technological task. Today's instruments, ranging up to the 1,000-foot Arecibo dish, can pluck signals as weak as 10^{-20} watt from the sky. Among phenomena such as quasars and pulsars, what other manner of cosmic exotica lurk? Astronomy's radio "eyes" — ears? — will likely reveal yet more wondrous features in the next 50 years. □