United States Department of the Interior
National Park Service

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations of eligibility for individual properties or districts. See instructions in *Guidelines for Completing National Register Forms* (National Register Bulletin 16). Complete each item by marking "x" in the appropriate box or by entering the requested information. If an item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, styles, materials, and areas of significance, enter only the categories and subcategories listed in the instructions. For additional space use continuation sheets (Form 10-900a). Type all entries.

1. Name of Property

historic name Reber Radio Telescope

other names/site number

2. Location

street & number National Radio Astronomy Observatory ☐ not for publication

city, town Green Bank ☐ vicinity

state West Virginia code WV county Pocahontas code 075 zip code 24944

3. Classification

Ownership of Property	Category of Property	Number of Resources within Property	
		Contributing	Noncontributing
☐ private	☐ building(s)		buildings
☐ public-local	☐ district		sites
☐ public-State	☐ site	1	structures
☒ public-Federal	☒ structure		objects
	☐ object	1	Total

Name of related multiple property listing:

Number of contributing resources previously listed in the National Register 1

4. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act of 1966, as amended, I hereby certify that this ☐ nomination ☐ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property ☐ meets ☐ does not meet the National Register criteria. ☐ See continuation sheet.

Signature of certifying official — Date

State or Federal agency and bureau

In my opinion, the property ☐ meets ☐ does not meet the National Register criteria. ☐ See continuation sheet.

Signature of commenting or other official — Date

State or Federal agency and bureau

5. National Park Service Certification

I, hereby, certify that this property is:

☐ entered in the National Register.
☐ See continuation sheet.

☐ determined eligible for the National Register. ☐ See continuation sheet.

☐ determined not eligible for the National Register.

☐ removed from the National Register.

☐ other, (explain:) _____

Signature of the Keeper — Date of Action

6. Function or Use

Historic Functions (enter categories from instructions)

Research Facility

Current Functions (enter categories from instructions)

Research Facility

7. Description

Architectural Classification (enter categories from instructions)

N/A

Materials (enter categories from instructions)

foundation concrete
walls N/A
roof N/A
other iron, wood, steel

Describe present and historic physical appearance.

The Reber Radio Telescope was designed and built by Grote Reber in 1937 for his personal use in conducting research in the newly emerging field of radio astronomy. The original location of the telescope was in the backyard of his house at 212 West Seminary Road, in Wheaton, Illinois. Grote Reber's house is no longer extant. The entire block of 200 West Seminary Road, in Wheaton, Illinois, was demolished during the 1950s to construct a public park.

The telescope was originally a 31 foot 5-inch transit-mounted parabolic radio telescope reflector made from 72 wooden radial rafters, covered with skin of 26 gauge point iron (focal length: 20 feet), and 2 elevated arches positioned on railroad wheels to permit changes in elevation angles. The telescope took about 4 months to build and weighed about 2 tons when completed.

Reber used the telescope from 1937 to 1948 when he sold it to the National Bureau of Standards which moved it to an observing site in Sterling, Virginia. After the telescope was moved to Sterling, the National Bureau of Standards mounted the entire instrument on a turntable thus changing the original transit design to an altazimuth design.

In 1952 the telescope was disassembled and shipped to another observing site in Boulder, Colorado. Finally, in 1957, it was acquired by the National Radio Astronomy Observatory, in Green Bank, West Virginia, where in 1959-60 it was reassembled under Grote Reber's personal supervision. Some wooden parts were found deteriorated and replaced during this process. The telescope now stands on its 1948 turntable to the left of the entrance road of the National Radio Astronomy Observatory, in Green Bank, West Virginia, in proximity to the Karl Guthe Jansky Replica Antenna and the Ewen-Purcell Antenna.

With the exception of the change of mounting from the transit design to the altazimuth design and the replacement of some deteriorated wooden support members, the telescope retains its integrity from the period of its first use by Grote Reber in 1937-48. The telescope is in good condition and can be used for radio astronomy if needed.

In 1972 the telescope was listed on the National Register of Historic Places by the Antiquities Commission of the State of West Virginia.[1]

☐ See continuation sheet

8. Statement of Significance

Certifying official has considered the significance of this property in relation to other properties:
[X] nationally [ ] statewide [ ] locally

Applicable National Register Criteria [X] A [X] B [ ] C [ ] D NHL Criteria 1,2,4

Criteria Considerations (Exceptions) [ ] A [ ] B [ ] C [ ] D [ ] E [ ] F [ ] G

Areas of Significance (enter categories from instructions)	Period of Significance	Significant Dates
National Register: Invention, Science	1937-1948	
National Historic Landmark: Science, Subtheme: Physical Science: Facet, Astronomy		

Cultural Affiliation: N/A

Significant Person: Grote Reber

Architect/Builder: Grote Reber

State significance of property, and justify criteria, criteria considerations, and areas and periods of significance noted above.

Summary

The Reber Radio Telescope was the first parabolic antenna specifically designed and built to do research in the newly emerging field of radio astronomy. The telescope was designed and built by Grote Reber, an amateur astronomer and electronics expert from Wheaton, Illinois, who from 1937 until after World War II, was the world's only active radio astronomer. The telescope design is the forerunner of the majority of present day radio telescopes.

History

Until the 20th century, astronomers were limited to what they could see or photograph in the visible spectrum of light--a relatively narrow band of wavelengths. This all changed in 1932, when Karl Jansky, a radio engineer at Bell Laboratories in Holmdel, New Jersey, was the first to establish that radiation at radio wavelengths was reaching the earth from interstellar space.[2]

Jansky joined Bell Laboratories in Holmdel, New Jersey, in 1928 and began studying static and other noises affecting Bell System transoceanic radio-telephone circuits. In 1929 he designed and built a 14.6 meter-rotatable, directional antenna system to study radio noise. Two years later he was able to classify the noise into three types: that due to local thunderstorms; that due to distant thunderstorms; and a steady hiss of static, the origin of which was not known.

This unknown static fascinated Jansky because its source could not be traced to any location on the earth or in the solar system. He made an extensive study of the noise in 1932, finding that it varied not every 24 hours but every 23 hours and 56 minutes. This is the period of the earth's sidereal day, a day defined by the earth's rotation relative to the stars, not the sun. Therefore the source of the noise was outside of the solar system and fixed in space. After discussing this information with an astronomer, Jansky concluded that the static was coming from the center of our galaxy, the Milky Way.

[ ] See continuation sheet

9. Major Bibliographical References

SEE CONTINUATION SHEET

☐ See continuation sheet

Previous documentation on file (NPS):
- ☐ preliminary determination of individual listing (36 CFR 67) has been requested
- ☐ previously listed in the National Register
- ☐ previously determined eligible by the National Register
- ☐ designated a National Historic Landmark
- ☐ recorded by Historic American Buildings Survey # _____
- ☐ recorded by Historic American Engineering Record # _____

Primary location of additional data:
- ☐ State historic preservation office
- ☐ Other State agency
- ☐ Federal agency
- ☐ Local government
- ☐ University
- ☐ Other

Specify repository: _____

10. Geographical Data

Acreage of property less than 1 acre

UTM References

	Zone	Easting	Northing
A	17	603180	4254000
B			
C			
D			

☐ See continuation sheet

Verbal Boundary Description

The boundary follows the outside perimeter of the telescope turntable.

☐ See continuation sheet

Boundary Justification

The boundary includes only the land upon which the telescope is sited, the sole historic resource.

☐ See continuation sheet

11. Form Prepared By

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Jansky published his findings in scientific journals, and, on May 5, 1933, The New York Times carried his discovery on the front page. Jansky's discovery of the existence of interstellar radio waves with his antenna liberated astronomers from the confines of optical astronomy and opened up the radio portion of the electromagnetic spectrum for productive research. The longer radio waves could penetrate not only the earth's atmosphere, but also clouds of interstellar dust that previously had obscured large sections of space. When Jansky was not allowed to continue with basic research into the field of radio astronomy by Bell Laboratories, another pioneer, Grote Reber, continued his work.

Grote Reber read Jansky's papers and was one of the first scientists to appreciate the significance of Jansky's discovery. To quote his own words:

> In my estimation it was obvious that Jansky had made a fundamental and very important discovery. Furthermore, he had exploited it to the limit of his equipment facilities. If greater progress were to be made it would be necessary to construct new and different equipment especially designed to measure the cosmic static. [3]

Reber's decision to continue Jansky's work meant that he would have to design and build the world's first radio telescope. Since no one had ever done this before, Reber was on his own. After studying the problem, he decided to construct a large parabolic reflector with the intention of observing at a very short wavelength, about 10 cm. He realized that a parabolic reflector would have the advantage of providing a narrow symmetrical beam and would also enable the wavelength to be altered simply by changing the receptor at the focus. In the choice of operating wavelength Reber was guided by two considerations: he could achieve better angular resolution and the radiation should be stronger at shorter wavelengths.

With these considerations in mind, Reber began to build the first radio telescope specifically designed for radio astronomical observations. Since he had no outside source of funding to build his telescope he had to do all of the work by hand in his own backyard. Reber originally preferred a full steerable mounting, but this was far too expensive, so he decided on a meridian transit instrument steerable in elevation only, relying on Earth's rotation to scan the heavens. While he wanted as large a reflector as possible, Reber had to balance the cost with his resources and finally decided on a sheet metal surface of 31-foot diameter, to be mounted on a wooden supporting structure for the sake of cheapness and ease of construction. The reflector surface consisted of 45 pieces of 26-gauge galvanized iron sheet screwed on 72 radial wooden rafters cut to parabolic shape. Reber cut, drilled and painted all of the parts. Except for the part-time assistance of two men on foundations and erections, Reber personally put together the radio telescope piece by piece, and completed the entire job in four months from June to September 1937. The final telescope cost Reber $4,000.

During the decade after 1937 Reber, using his telescope, worked practically alone in the field of radio astronomy. By 1940 he confirmed Jansky's conclusion that the Milky Way is a source of radio radiation, and in 1944 he published in the Astrophysical Journal the first contour maps of radio brightness of the Milky Way as it appears at a wavelength of 1.87 meters. He discovered discrete sources of radio emission in the galactic center, Cygnus, and Cassiopeia, as well as radio waves from the sun. From 1937 until after World War II Reber was the world's only active radio astronomer.

Reber's Radio Telescope stands today as a monument to Grote Reber, a pioneer in the field of radio astronomy. With the construction of his telescope, Reber demonstrated his persistence in overcoming technical difficulties and his determination to do pioneering work in the field of radio astronomy. Grote Reber's work from 1937 to 1948, using the radio telescope he personally designed and built, demonstrated the importance of Jansky's discovery, and forever changed the science of astronomy.

Footnotes

1. The descriptive material for this section was taken from the following sources:

   Wallace R. Oref, "National Register of Historic Places Inventory-Nomination Form--Reber Radio Telescope." (Green Bank, West Virginia: National Radio Astronomy Observatory, 1972).

   Historical Radio Telescopes at the National Radio Astronomy Observatory in Green Bank, West Virginia (Green Bank, West Virginia: Associated Universities, Inc., no date).

   J.S. Hey, The Evolution of Radio Astronomy (New York: Neale Watson Academic Publications, Inc., 1973), pp. 8-15.

2. The material for the statement of significance was taken from the following sources:

   George A. Abell, The Exploration of the Universe (4th ed.; New York: Saunders College Publishing, 1982), pp. 220-224.

   Hey, op. cit.

   John Kraus, "The First 50 Years of Radio Astronomy, Part 1: Karl Jansky and His Discovery of Radio Waves from Our Galaxy," Cosmic Search, Fall 1981, pp. 8-12.

   Oref, op. cit.

3. Hey, op. cit., p. 9.

Bibliography

Aaronson, Steve. "Radio Astronomy and the Big Bang," Bell Laboratories Record. January 1979, pp. 6-11.

Abell, George O. Exploration of the Universe. 4th ed., Philadelphia: Saunders College Publishing, 1982.

Asimov, Isaac. Asimov's Biographical Encyclopedia of Science and Technology. 2nd ed., New York: Doubleday & Company, Inc., 1982.

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Kellerman, K., and B. Sheets, ed., Serendipitous Discoveries In Radio Astronomy. Green Bank, West Virginia: National Radio Astronomy Observatory/Associated Universities, Inc., 1983.

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Struve, Otto, and Zebergs, Velta. Astronomy of the 20th Century. New York: Macmillan Company, 1962.

Ronan, John J. "An Oracle Comes of Age: The National Radio Astronomy Observatory," Ham Radio Horizons, May 1977, pp. 12-16.

The National Radio Astronomy Observatory. Green Bank, West Virginia: National Radio Astronomy Observatory/Associated Universities, Inc., 1988. (Brochure)