

## ASTRONOMY

# Eclipse Observed in Rain

Radar antennae used in place of optical instruments by expedition to Attu, Alaska, to measure frequencies in radio spectrum.

## See Front Cover

► THE FIRST eclipse ever successfully observed by an expedition party soaked to the skin in a torrential downpour during a gale was reported in a series of three papers presented before members of the American Astronomical Society meeting at Strawbridge Observatory, Haverford, Pa.

The expedition to Attu, Alaska, to observe the solar eclipse last Sept. 12 was conceived and organized by Dr. John P. Hagen of the Naval Research Laboratory. It was designed for the express purpose of making measurements at a variety of frequencies in the radio spectrum. Radar antennae instead of telescopes and other optical instruments were used to study the solar eclipse. The whole setup is shown on this week's front cover.

Grote Reber of the National Bureau of Standards reported on the observations he and E. A. Beck, also of the Bureau, made at 65-centimeter wavelength with war-developed radar-like instruments.

Fred T. Haddock of the Naval Research Laboratory told of measurements of three- and ten-centimeter radiation he had made along with Cornell H. Mayer, Timothy P. McCullough, Donald R. White and Russell M. Sloanaker, all of NRL.

Almost a month was spent on the island installing equipment and making preparations. The small island of Attu, last and most westerly of the Aleutian chain, was chosen because it was the only place the eclipse path crossed American territory.

Dish-pan shaped "mirrors" of solid metal were used to capture outbursts from the sun. These antennae were set up on an old runway on Alexai Point, one of the few open flat places on the whole island. Two of these "mirrors" were six feet across and another 10 feet. A fourth antenna, two feet across, was also installed, but it proved inoperable because of the rain.

The sun is constantly radiating vast amounts of energy of one sort or another. Light and heat are those with which we are most familiar.

Through radio receivers you make use of radio waves about a quarter of a mile long. Radio hams communicate on waves about the length of a city lot. Experimental scientists, however, are using much shorter waves to explore the sun.

The sun explored by radio waves is slightly larger than that seen visually. Visually, we see energy originating in the sun's bright photosphere: with a radio we

hear static coming from the sun's outer atmosphere or corona.

Preliminary results indicate that at the time of totality the sun is not totally eclipsed. A total of 5.6%, 22.5% and 25% of the sun's effective disk is left exposed at three-, 10- and 65-centimeter wavelengths, the radio experts reported.

Because the "radio" sun is larger than the moon, all eclipses viewed with radio apparatus will be annular rather than total—the moon just never can quite blot them all out.

A minimum of radio signals from the sun was observed not when the moon first visually covered the sun's disk, but a few minutes after totality. This delay in minimum was observed at all three wavelengths.

The delay was probably due, astronomers were told, to the fact that the sun's outer envelope or corona was not entirely symmetrical in intensity. It was made irregular

by a group of sunspots near the east limb.

In the visible region sunspots appear much darker than the rest of the sun because they are radiating less energy. But at the centimeter wavelengths used, sunspots radiate great amounts of radio energy and thus are many times "brighter" than the rest of the sun. Thus extra energy radiated from these spots, upsetting the symmetry of the corona.

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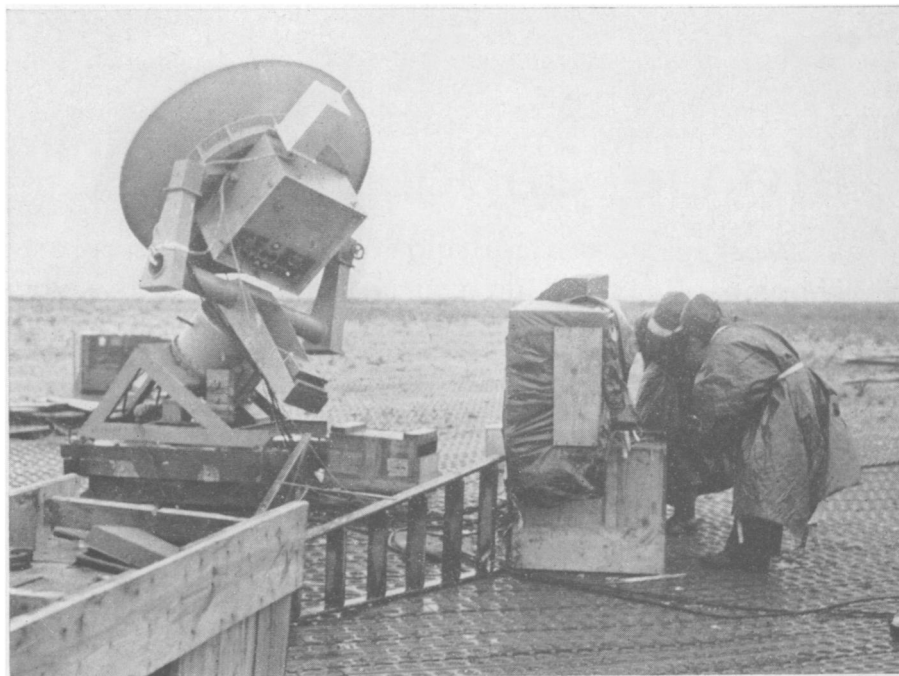
## Electric Blanket Helps Sun Observation

► AN ELECTRIC blanket was used to keep a sun-observing instrument warm during flight in a B-29 high altitude flying laboratory.

Dr. Romuald Anthony of the U. S. Naval Ordnance Test Station, Inyokern, Calif., reported to the American Physical Society meeting in Los Angeles that the electric blanket kept the temperature of the instrument constant within two degrees Fahrenheit.

The instrument, a monochromator, focuses the sun's rays so that they can be observed at one wavelength only. The infrared region was studied during this flight.

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**OBSERVING IN RAIN**—A howling gale does not deter these observers of a solar eclipse. Here are shown Cornell H. Mayer and Timothy P. McCullough at the 10-centimeter radiometer. All loose gear and power supplies have been put in crates and covered with waterproofing material as protection against the weather. The large box behind reflector contains the principal part of the receiver. Smaller box on top contains a thermostatically controlled oven containing a "black body" for calibration.