

PHOTOGRAPHS OF THE CORONA TAKEN DURING THE TOTAL
ECLIPSE OF THE SUN ON JULY 9, 1945, AT PINE
RIVER, MANITOBA, CANADA

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ABSTRACT

An expedition which went to Pine River, Manitoba, Canada, to observe the total eclipse of the sun on July 9, 1945, is described, and coronal photographs secured during the eclipse are presented.

At a conference held at the Yerkes Observatory in May, 1945, it was decided to send an expedition to Canada to observe the total eclipse of the sun on July 9, 1945, and secure photographs of the corona. The authors of this report undertook to organize the expedition.

In view of the very short duration of the totality of this eclipse (it was 37 seconds at Pine River), it appeared to us that, for the sake of the completeness of the record, attempts should be made to secure both small-scale and large-scale photographs of the corona in order that both the outermost extensions of the corona and the structure of the inner parts could be studied. It was further thought that the 6-inch UV telescope of the Yerkes Observatory with an appropriate reduction in the aperture would prove suitable for obtaining a small-scale photograph, while a long-focus camera in combination with a coelostat would be adequate for obtaining the large-scale photographs. Accordingly, the 6-inch UV telescope was dismantled for transporting to the site of observation to be selected. As for the long-focus camera, it appeared that a 2-inch doublet, which was available, would be inadequate to insure sufficient intensity of light during the short period of totality. Drs. L. G. Henyey and J. L. Greenstein therefore designed a 4-inch doublet, corrected for the green and the blue, and 20 feet in focal length. The lens was made in the optical shop of the Observatory by Mr. Fred Pearson on very short notice. This lens was used to obtain the large-scale photographs. A wooden framework for the camera was constructed at the Observatory. Further, a common drive was devised for both the 6-inch UV telescope and the coelostat.

After some consideration it was decided to observe the eclipse in the general neighborhood of Pine River, Manitoba, as this region appeared to be a fair compromise between accessibility and duration of totality. From the point of view of weather conditions, there did not seem much room for choice.

The expedition, consisting of the two writers of this report (later joined by Dr. Burke Smith), left Williams Bay on June 28 and arrived at Pine River on June 30. After some exploration, the site was chosen on July 1 on a slight ridge commanding a clear view of the eastern sky and some five miles from Pine River. This was 0.7 mile south of the central line of totality, and the altitude of the place was estimated at 1100 feet.

A concrete foundation was laid for mounting the 6-inch telescope, the coelostat, and the common driving mechanism. Two further piers were also erected for supporting the wooden framework of the 20-foot camera. The adjustments of the instruments were made during the following days, though the cloudy sky prevailing during a large part of the time made this a matter of some difficulty.

The eastern sky was clouded at sunrise on July 9, but the drifting clouds produced a clear region some twenty-five minutes before totality. During totality there were clouds only very near the horizon in the eastern sky; however, there was a thick bank of clouds

in the western sky extending to an altitude of about 40° . The entire sky clouded over again half an hour later.

The program which was carried through was the following:

Dr. Burke Smith, who had in the meantime joined the expedition, acted as a counter, and counted backward from 60, starting at exactly one minute before the computed instant of the second contact ($7^{\text{h}}17^{\text{m}}45^{\text{s}}$ central war time),¹ the zero to be announced when the Baily's beads disappeared. (Actually, as it turned out, the second contact occurred at the predicted moment within a fraction of a second.)

The 6-inch telescope, the aperture of which had been reduced to 3 inches, was operated by Chandrasekhar. One exposure of 14 seconds was given on a backed Eastman 33 plate. The 20-foot camera was operated by Hiltner, who took two exposures of 20 seconds and 5 seconds, respectively, on (unbacked) Eastman spectroscopic plate II-H. Positive contact prints from the 3 photographs secured are shown in Plates X and XI.

It will be noticed that in the small-scale photograph (Pl. X, *a*) the disk of the moon appears somewhat oval. This must be due to an accidental disturbance of the telescope during the operation having caused a slight backlash in the driving mechanism. However, this does not affect the quality of the photograph in the regions where the structure of the corona becomes distinguishable. It will be seen that the coronal extensions can be traced fully to over 2 solar diameters. The large-scale photographs (Pls. X, *b*, and XI), particularly the one with the longer exposure (Pl. XI), show an extraordinary amount of detailed structure. While these photographs resemble in many ways the earlier photographs taken during the minimum phase of solar activity and reveal, as could have been anticipated, an equatorial type of corona, it would appear that the streamers in the equatorial plane are perhaps more fully developed than in the earlier photographs. It should perhaps be recorded in this connection that there was exceptional auroral activity during the days immediately preceding and following the date of the eclipse.

The original plates have been calibrated, and we hope to present the results of a quantitative study of the intensity distribution in the corona in a later paper.

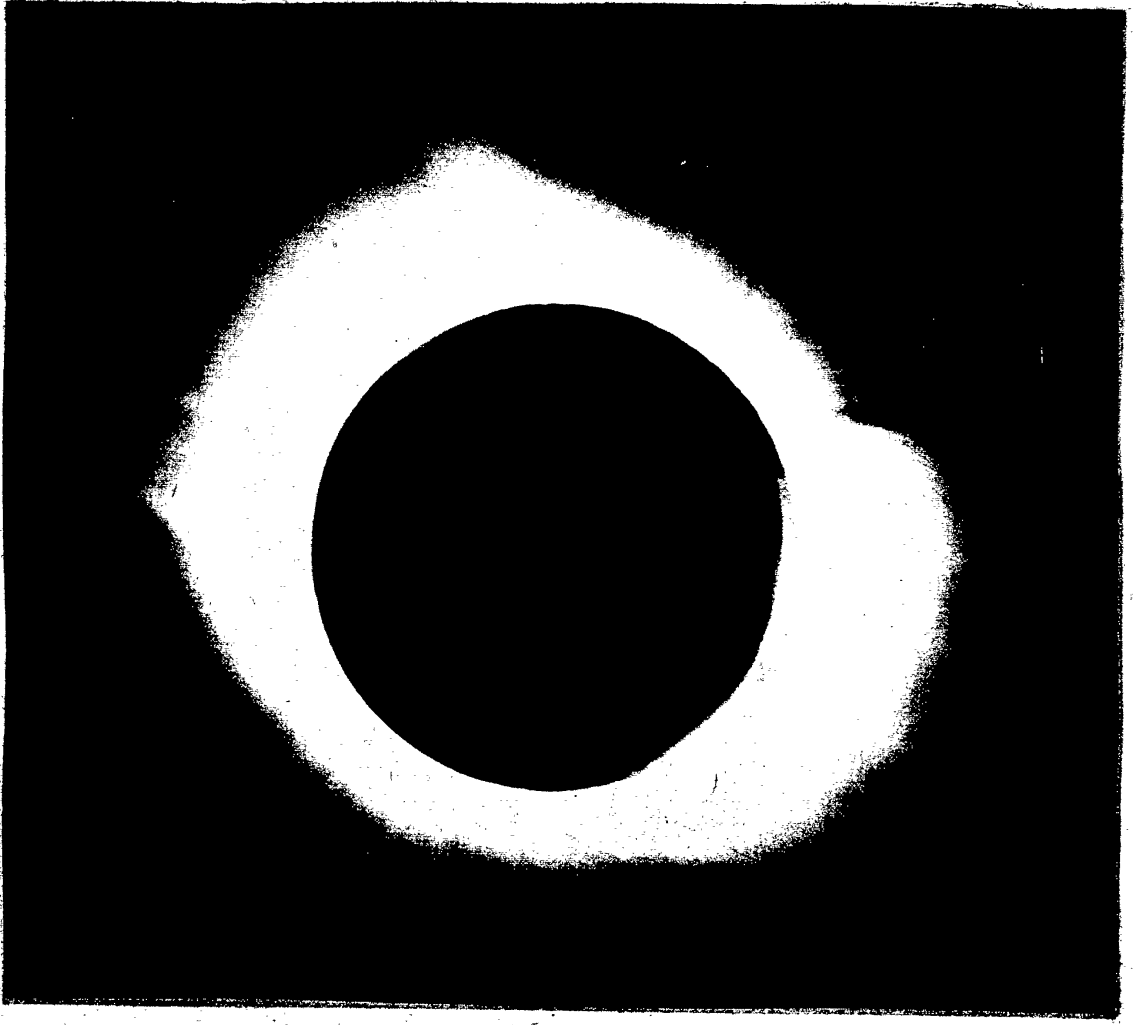
Even so modest an expedition as ours could not have been successfully completed without the co-operation of many individuals. To the names already mentioned we would like to add: Dr. O. Struve who first suggested the organizing of the expedition and later supported it; Dr. W. W. Morgan, who advised and assisted us with the development and the printing of the photographs; Messrs. E. Krebs and J. Vosatka, who assisted in various ways with the preparations of the expedition; Mr. D. M. Stephens, deputy minister of the Department of Mines and Natural Resources, Winnipeg, who gave us valuable information concerning the regions where the track of totality crossed Saskatchewan and Manitoba; Constables Wannamaker and Dempsey of the Royal Canadian Mounted Police, in charge of the region of Pine River, who co-operated with the objectives of the expedition in numerous ways; and, finally, Mr. Harry J. Marko, proprietor of the Pine River Hotel, Pine River, for exceptional consideration and hospitality during our stay in Pine River.

¹ The time signals from the Bureau of Standards, Washington, D.C., were available on a Hallicrafter Sky Champion radio installed on the site.

PLATE X

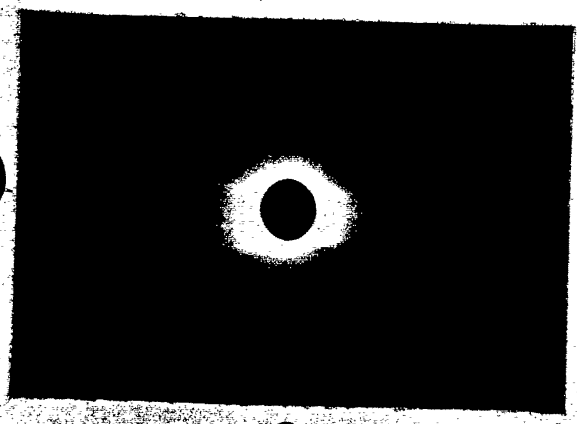
S

b)



W

(a)



W

S

PHOTOGRAPHS OF SOLAR CORONA TAKEN JULY 9, 1945

- a) 14-second exposure with 6-inch UV telescope (aperture reduced to 3 inches)
- b) 5-second exposure with 20-foot camera

PLATE XI

