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TOTAL SOLAR ECLIPSE OF MARCH 7, 1970,
AND THE FORM OF THE SOLAR CORONA

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The total solar eclipse of March 7, 1970, was visible in the equatorial regions of the Pacific Ocean, Central America, Florida, east coast of the U.S.A. and in the north regions of the Atlantic Ocean.

The form of the solar corona was determined from the photographs (Fig. 1) by Mr. S.I. Gale who observed this eclipse in North Carolina. To obtain isophotes of the corona from the original pictures an application of photographic equidensities by using the Sabattier effect has been used (Fig. 2).

The oblateness ε of the solar corona is according to Ludendorff /1/

$$\varepsilon = \frac{d_4 + d_5 + d_6}{d_1 + d_2 + d_8} - 1 ,$$

where d_1 is the diameter of the corona at the position angle 0° (polar diameter), d_2 the diameter at $P = 22.5^\circ$, etc., d_5 the diameter at $P = 90^\circ$ (equatorial diameter), etc., d_8 the diameter at $P = 157.5^\circ$. The diameters d_1 through d_8 are expressed in units of the Moon's diameter. The oblateness ε of the corona relates to the distance R , given by the equation

$$R = \frac{1}{3}(d_4 + d_5 + d_6)$$

The oblateness of the corona may be expressed by the relation (for $1.0 < R < 2.0$)

$$\varepsilon = a_0 + b_0(R - 1) .$$

For the solar eclipse of March 7, 1970, the following values of the constants a_0 and b_0 have been found:

$$a_0 = 0.00 \pm 0.01$$

$$b_0 = 0.02 \pm 0.01 .$$

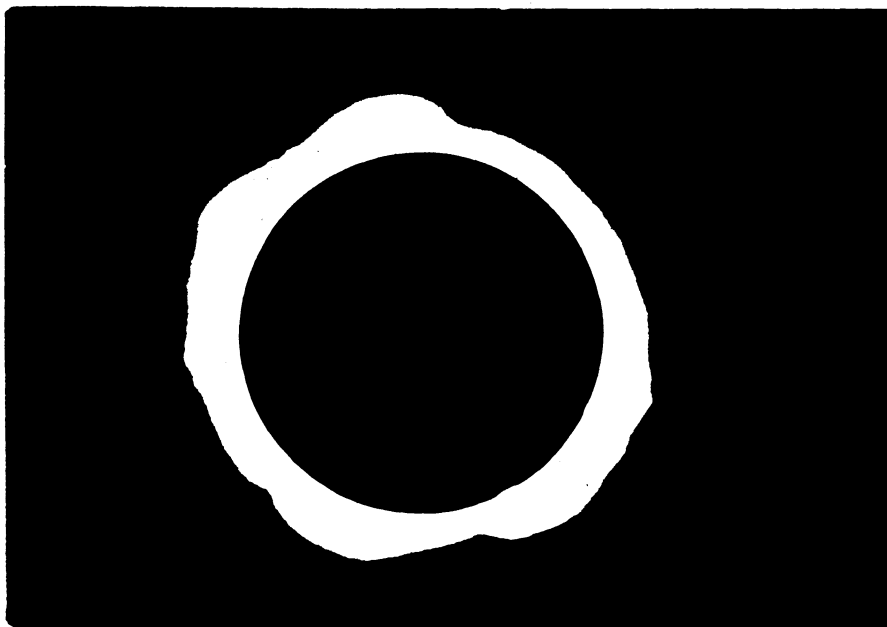


Fig. 1.

The sum $a_0 + b_0$, which represents the oblateness of the corona at the distance $R = 2$ from the centre of the Moon's disc (or $R = 1$ from the lunar limb), is according to Ludendorff a characteristic value of the oblateness of the solar corona. It depends on the phase of the solar activity. At the eclipse of March 7, 1970, the value

$$a_0 + b_0 = 0.02$$

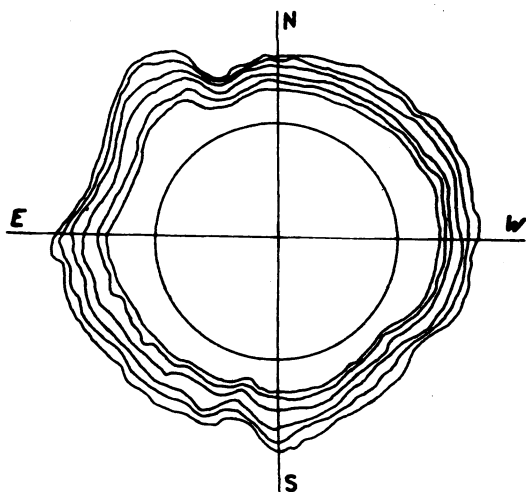


Fig. 2.

of ϵ shows that the corona in March 1970 was of a typical "polar" type.

The writer is indebted to Mr. S.I. Gale and Mr. J. Klepešta for placing the pictures of the mentioned solar eclipse at his disposal.

References

- /1/ Ludendorff L., Sitz. Ber. Preuss. Akad. Wiss., Math.-phys. Klasse, Bd. XVI, 185 (1928).
- /2/ Waldmeier M., Definitive Sunspot-Numbers for 1969. Eidgen. Sternwarte, Zürich (1970).

shows that the corona was practically circular. The epoch of the maximum of the 20th cyclus of solar activity being 1968.9 according to Waldmeier /2/, the solar eclipse of March 7, 1970, set in 1.3 years after the maximum of solar activity. The obtained value of the oblateness of the corona for the eclipse of March 7, 1970, is in very good agreement with Ludendorff's results. The very small value