

### Note on a photographic method of observing variable stars for amateurs,

By H. G. TOMKINS, Esq., C.I.E., F.R.A.S.

THE method of determining the magnitudes of variable stars from measures of the diameter of their images on photographic plates is, of course, well known and formulae exist for the purpose. To obtain the plates for this method, however, a properly clock-driven apparatus is necessary and this is beyond the means of many amateurs. It has occurred to me that some work in this direction ought to be possible from star-trails taken in a fixed camera, and this would be within reach of nearly every one, and could be applied to all the brighter variables at any rate or if a telescope to take the photographs is used even fainter stars.

A method of obtaining trails has already been described in the Journal of the Society, and I need only repeat here that it consists in pointing the camera to the star to be photographed, and then exposing the plate for a few minutes and developing it in the ordinary way. It will be noticed that the trails of the brighter stars are wider than those of faint stars, and I think it should be possible to determine the magnitudes by measuring the width of the trails, and then calculating the magnitudes according to the given formula. A fine scale with a magnifying glass would probably suffice for the measurements, and there are several papers in the monthly notices of the Royal Astronomical Society on the subject of the formula which I think could be applied to the trails.

The subject is worth examination and is an investigation which can be made at one's writing table. It is a good one, therefore, for members of the Astronomical Society of India to take up, and I hope that some one will come forward to devise a method from the data available. When this has been done I shall be glad to supply him with plates of star trails from which to make experimental measures. He will, therefore, need no telescopic equipment at all. I shall also be glad to refer him to such information on the subject as I have at my disposal.

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### Orbit of Eros, its next opposition on April 19th, 1917,

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Eros's mean distance from the Sun is 1.458 astronomical units, with a period of 643 days. Its mean distance is less than that of any other asteroid and therefore is of great value in correcting the Sun's parallax. Its nearest approach to

the Earth will occur on 19th April 1917, at a distance of only 0.4986 astronomical units, or 46,000,000 miles. The details are as follows:—

$$\begin{aligned}
 M &= 74^\circ 8' 17.4'' & \text{Log } a &= 0.1638461. \\
 \pi &= 121^\circ 25' 31.9'' & \text{Log } c &= 9.3482445. \\
 \alpha &= 303^\circ 35' 8.69'' & \text{Log } q &= 0.0542801. \\
 i &= 10^\circ 49' 39.64'' & u &= 2014''.8299. \\
 X &= r (9.99461) \sin (34^\circ 3' 41'' + u) \\
 Y &= r (9.94143) \sin (299^\circ 0' 14'' + u) \\
 Z &= r (9.70826) \sin (319^\circ 31' 38'' + u)
 \end{aligned}$$

	R.A.			Decl.	Logr.	Log $\Delta$
	h.	m.	s.			
On March 1 ...	15	4	15	—39° 47' 43"	0.10126	9.75592
„ April 19 ...	14	55	2	—50° 27' 30"	0.15070	9.69779
„ June 1 ...	13	56	9	—38° 33' 25"	0.19054	9.79274

### Paper on Last Year's Sun-spots,

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DURING last year the maximum solar activity has continued to manifest itself as in 1915. Indeed the spot surface even increased somewhat until June 1916, when a violent paroxysm was followed by comparative calm, varied with several fluctuations. The northern hemisphere has had nearly double the number of spots that the southern hemisphere has produced. Many of the spots have been visible by the naked eye. Many spots have increased in size with extraordinary rapidity. From the 18th to the 20th of August, within the 48 hours, a little group of spots has increased more than ten-fold in diameter, from 6,000 to 65,000 miles. The largest spot had a diameter of 80,000 miles; it had an immense tongue of fire, which almost crossed the dark back-ground like a bridge. Last year the records for the highest latitude of a sun-spot has been recorded, namely, 59 degrees. Hitherto the highest latitude recorded (by Peters in 1846) was 50 degrees. Moreover, the greatest protuberance hitherto recorded was photographed by Mr. Evershed in Kashmir on 26th May 1916, extending to a distance from the limb of 18 minutes, or 500,000 miles, or over twice the distance of the Moon from the Earth. These great fountains of fire have been expelled from the Sun at the velocity of 120 miles per second. The terrestrial magnetic activity has been correspondingly excessive last year, though it does not synchronize exactly with the solar activity for some reason as yet not known.