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COMET ENCKE IN 1924

By G. VAN BIESBROECK.

MICROMETRIC MEASURES WITH THE 40-INCH REFRACTOR.

1924	G. M. T.	$\Delta\alpha$	$\Delta\delta$	n	α app.	δ app.	$\log p\Delta$	$\log p\Delta$	★
	h m s	m s	' "		h m s	° ' "			
Aug. 24	20 4 3	+0 53.20	+0 23.5	25-5	4 48 9.01	+34 19 11.4	9.681 n	0.534	1
26	19 27 57	-3 48.74	+3 38.6	25-5	4 57 38.12	34 48 42.2	9.707 n	0.597	2
28	19 41 59	-0 15.36	+2 36.8	8-8	5 7 52.40	35 17 36.1	9.704 n	0.571	3
Sept. 3	19 7 0	+0 4.04	-6 30.3	8-8	5 42 20.52	36 31 2.0	9.729 n	0.641	4
16	21 56 37	+5 19.40	-0 25.3	25-5	7 23 22.84	36 35 32.0	9.641 n	0.396	5
20	20 45 39	-5 47.68	+2 14.5	25-5	8 0 13.17	35 17 2.2	9.714 n	0.603	6
21	22 7 21	+1 54.69	-2 21.1	25-5	8 10 23.37	34 47 14.5	9.652 n	0.465	7
23	22 21 25	+1 32.14	-1 19.6	25-5	8 29 56.54	33 39 51.5	9.643 n	0.524	8
Oct. 7	22 28 17	-1 50.73	+4 2.2	25-5	10 39 57.38	19 57 25.1	9.647 n	0.698	9
11	22 37 56	+1 56.58	+0 28.0	25-5	11 11 52.37	14 52 41.2	9.639 n	0.727	10
13	22 45 1	-4 0.36	+2 41.7	20-4	11 26 53.87	12 17 19.9	9.634 n	0.737	11
17	22 54 39	-1 33.73	+4 28.7	30-6	11 55 25.46	7 6 41.1	9.628 n	0.756	12
20	23 13 38	-1 32.13	+6 29.6	25-5	12 16 0.71	+ 3 15 27.3	9.621 n	0.764	13
24	23 31 38	+0 42.24	+0 23.3	10-2	12 43 14.52	- 1 48 9.1	9.617 n	0.777	14

Comparison Stars (1924.0)

	α	δ	Red. loc. app.		Cp. Stars
	h m s	° ' "	s	"	
1	4 47 14.28	+ 34 18 56.4	+ 1.53	- 8.5	A. G. Lei. 1789
2	5 1 25.37	34 45 12.6	+ 1.52	- 9.0	Prager 1901
3	5 8 6.21	35 15 8.7	+ 1.55	- 9.4	Prager 1939
4	5 42 14.97	36 37 43.1	+ 1.51	- 10.8	Prager 2161
5	7 18 2.26	36 36 10.4	+ 1.18	- 13.1	A. G. Lu. 3813
6	8 5 59.93	35 15 0.9	+ 0.92	- 13.2	Prager 3044
7	8 8 27.75	34 49 48.8	+ 0.93	- 13.2	Prager 3058
8	8 28 23.56	33 41 24.1	+ 0.84	- 13.0	A. G. Lei. 3568
9	10 41 47.54	19 53 31.4	+ 0.57	- 8.5	Abbadia 6106
10	11 9 55.32	14 52 20.3	+ 0.47	- 7.1	Bord. ph. +15°, 11 ^h 8 ^m , Nr. 115
11	11 30 53.78	12 14 44.3	+ 0.45	- 6.1	A. G. Lpz. I 4333
12	11 56 58.70	7 2 17.2	+ 0.49	- 4.8	π Virginis — Amer. Eph.
13	12 17 32.33	+ 3 9 1.5	+ 0.51	- 3.8	Abbadia 7252 + p. m. (Cin. 18, 1549)
14	12 42 31.76	- 1 48 29.8	+ 0.52	- 2.6	Alger ph. - 1°, 12 ^h 44 ^m , Nr. 75

(41)

PHOTOGRAPHIC OBSERVATIONS WITH THE 24-INCH REFLECTOR.

1924	G. M. T.	Exp.	(1924.0)		log $p\Delta$		Cp. Stars
			h m s	° ' "			
July 28	19 41 15	61 min.	3 17 5.90	+ 27 21 28.4	9.675 n	0.657	Oxf. ph. +27°, 7218, 7186, 7220
31	20 45 32	53 min.	3 24 52.18	28 6 32.3	9.622 n	0.561	Oxf. ph. +28°, 6774, 6741, 6775
Aug. 7	20 1 18	40 min.	3 44 34.30	29 52 8.2	9.665 n	0.593	Oxf. ph. +29°, 9426, 9469, 9427
Sept. 29	22 6 30	1 min.	9 28 7.45	28 55 37.3	9.667 n	0.614	Oxf. ph. +29°, 27578, 27579, 27557
30	22 40 14	1 min.	9 37 48.95	27 55 20.9	9.640 n	0.586	Oxf. ph. +28°, 28953, 29005, 28956
Oct. 5	21 19 5	1 min.	10 22 34.63	+ 22 27 1.3	9.670 n	0.737	Paris ph. +23°, 10 ^h 20 ^m , 123, 129, 136

Remarks

- July 28 — Very faint and diffuse image located on the plates after the recovery of the comet on July 31. Total brightness hardly more than 17^M.
- July 31 — Comet first recovered on this date. Diffuse nebulosity elongated in position angle 60° in which direction it is about 30'' across. Total brightness 16.5.
- Aug. 7 — Plate exposed by MR. O. STRUVE.
- Aug. 24 — Faint diffuse nebulosity some 20'' in diameter, with hardly a condensation. Total brightness about 15^M.
- Aug. 28 — Diameter much increased. About 75''. Diffuse nebulosity. Total mg. 14^M.5.
- Sept. 2 — Sky good. Comet invisible. Its place safely located with the Wolf-Palisa chart. The brightness must have dropped more than 1^M.
- Sept. 3 — Comet much easier than on Aug. 28. Can be seen as a faint nebulosity in 4-inch finder. This time a 15^M nucleus about 5'' in diameter is showing. It precedes a short tail extending to 90'' from the nucleus in direction 80°. There is hardly any nebulosity preceding the nucleus.
- Sept. 16 — Seen without difficulty in 4-inch finder in spite of the moonlight. Large nebulosity with a total brightness 11^M. Settings with the 40-inch are difficult on account of the diffuseness of the nucleus.
- Sept. 20 — Settings uncertain on a milky sky with the *Moon* not far off.
- Sept. 21 — Sky transparent but *Moon* near. In the finder the total brightness is estimated 9^M.0. Nucleus still very diffuse. The head is nearly all on the following side of the nucleus; it extends to about 2' from the condensation.
- Sept. 23 — Nucleus 12^M, very diffuse, making the settings doubtful. Total brightness in finder 8^M.8.
- Oct. 5 — On a 30-min. exposure with the 24-inch reflector guided on the comet, it appears very similar to its aspect on a photograph taken ten years ago by BARNARD. (See *Pop. Astr.* Vol. 22, p. 608, 1914). Opposite the bright coarse tail there appears in addition a faint, slender tail, slightly wavering, extending to about 8' from the nucleus in position-angle 305°.
- Oct. 7 — Nucleus about 5'' in diameter and somewhat better defined. Nebulosity extends to about 2' distance on following side of nucleus. Total brightness 8^M.
- Oct. 11 — Settings become easier because the nucleus is better defined.
- Oct. 13 — Total brightness 7^M.0. Nucleus about 3'' in diameter.
- Oct. 17 — Total brightness 7^M.0. Images exceedingly poor.
- Oct. 20 — Total brightness 6^M.8.
- Oct. 24 — Sky too bright for estimation of magnitude. Comet hardly visible at low altitude.

As customary in all my estimations of magnitudes of comets, the brightness was obtained extrafocally, the eye-piece being shifted so much out of focus that the comet and the stars used as reference for the brightness (Harvard Scale) would appear nearly equal in size. In this way the observation becomes almost a comparison of surface-brightnesses and I feel that this is the only safe way of obtaining the integrated light of the comet.

In the following table the estimated magnitudes are gathered. The third column, giving the magnitudes

reduced to unit-distances, using the square-distance law for both geocentric and heliocentric distances, shows that the comet has brightened up considerably faster than would result from that law:

1924	Observed Mag.	Reduced to $\Delta = 1$ and $r = 1$ by $-5 \log r\Delta$	Reduced to $\Delta = 1$ by $-5 \log \Delta$	$\log r$	Reduced by $-5 \log \Delta - 15 \log r$
July 28	17.	14.6	15.8	+ 0.24	12.2
31	16.5	14.2	15.4	+ 0.23	12.0
Aug. 24	15.0	13.9	14.6	+ 0.14	12.5
28	14.5	13.6	14.2	+ 0.12	12.4
Sept. 16	11.0	11.4	11.5	+ 0.01	11.3
21	9.0	9.6	9.5	- 0.02	9.8
23	8.8	9.7	9.4	- 0.04	10.0
Oct. 7	8.0	9.4	8.6	- 0.17	11.2
13	7.0	8.6	7.4	- 0.25	11.1
17	7.0	8.6	7.2	- 0.32	12.0
20	6.8	8.7	7.0	- 0.35	12.2

The observations cover a range of about 10^M while the computed range would hardly be 6^M . By correlating the values of $\log r$ with the magnitudes reduced to geocentric distance-unity (4th column) it is found that the brightness varies as the 6th power of the heliocentric distance. After introducing this value we find (column 6) still large oscillations around the average-value of $11^M.5$. The whole series would roughly be represented by:

$$\text{Apparent magnitude} = 11^M.5 + 5 \log \Delta + 15 \log r.$$

The deviations of the individual estimations (column 6) are too large to be attributed to errors of observation; they show that the brightness is not simply an exponential function of the heliocentric distance.

The formula as it stands gives for the maximum brightness of ENCKE's comet at aphelion only 23^M . From the run of the values in column 6, there is an indication that the brightness would probably be fainter yet.

This accounts for the difficulty in definitely locating the object on plates exposed in 1913 with the 60-inch reflector at Mount Wilson (*Pop. Astr.* 22 p. 609-1914). It seems very improbable to me that the object could be reached in the more remote parts of its orbit.

*Yerkes Observatory, Williams Bay, Wisconsin,
November 12, 1924.*

MEASURES OF 100 DOUBLE STARS MADE WITH THE 26-INCH REFRACTOR OF THE LEANDER McCORMICK OBSERVATORY,

BY CHAS. P. OLIVIER.

The present paper forms the thirteenth of the series, begun in 1906, which contains measures of double stars by the writer. As all of these measures, except those contained in *Lick Observatory Bulletins* Nos. 175 and 190, were made with the 26-inch McCORMICK refractor they should form a very homogeneous series. In accord with policies already outlined, most of the stars chosen for measurement are relatively new discoveries. In addition, there are included some stars of a list with southern declinations sent by DR. R. G. AITKEN, and which were in need of observations.

Of the newer discoveries there are in the present paper measures of 25 JONCKHEERE, 14 HUSSEY, 13 AITKEN, 10 ESPIN and 7 OLIVIER pairs. There are 67

with northern and 33 with southern declinations. As to distances 17 are less than $1''.00$, 40 from $1''.01$ to $2''.00$, 28 from $2''.01$ to $3''.00$, and 15 wider than $3''$. The wider ones include *Sirius* and several brighter stars with faint companions.

The right ascensions and declinations are given for 1920.0. When possible these are taken from *Catalogue of Double Stars* by JONCKHEERE. In such cases the catalogue number appears in brackets [.]. When the star is in BURNHAM's *General Catalogue* the number appears without brackets. The magnitudes are all estimates made at the telescope. Powers 336, 560, 600, 850, 1300 and 1500 were used, probably the 850 most frequently. Most of the measures were made under good conditions of seeing.