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Definitive Determination of the Orbit of Comet 1898 I.

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Contents.

§ 1. Discovery.

Comet 1898 I was discovered by Prof. C. D. Perrine at Mt. Hamilton on March 19th, 1898, in 21h RA. and +17° Decl. He described it on this date as about equal to a sixth magnitude star with a coma nearly 2′ in diameter. There was a bright condensation about 10″ in apparent diameter and a broad fan-shaped tail which could be traced for a degree in the four-inch comet seeker. The comet had just passed perihelion (March 17) and was visible for nine months during which time it swept over a heliocentric arc of 110°. Its nearest approach to the earth was made on March 25th, at which time its distance was one hundred and forty seven million miles.

§ 2. Physical Characteristics.

During the first two months of its apparition period it was visible to most observers as a small, round coma with a short tail and a well marked nucleus which under favorable circumstances was of star-like sharpness. This nucleus became invisible in most telescopes before the end of May, but under the favorable conditions obtaining at Mt. Hamilton it was visible much longer and traces of a nucleus were seen as late as the middle of September when the comet was only 10″ in diameter and about equal to a 16m star in brightness.

No unusual phenomena were observed in coma or tail with the exception of a sharp fan-shaped jet in the head on the s. f. side of the nucleus which was observed by Perrine on April 7th and was still visible one month later.

The spectrum was observed visually by W. H. Wright at Lick Observatory on May 9, 1898. It was of the usual type; the three caracteristic bands superimposed on a relatively strong continuous spectrum.

Some thirty observations of the position angle of the tail were made at various observatories. The tail was not an easy object on which to make accurate settings, nevertheless the measures are as accordant as could well be expected from the difficult nature of the object, with the exception of those from Copenhagen which differ widely from the mean. In the following table are given in successive columns, the place of observation; the Greenwich date; the observed position angle, p; $p - p_0$, the difference between the observed position angle and the position angle of the radius vector; the last column, $u - u_0$, gives the angle in the plane of the orbit between the radius vector produced and the observed axis of the tail.

Place of Observation	1898	p	$p-p_0$	$u-u_0$
Mt. Hamilton	Mar. 20.0	281°2	171°	+ 8°
Pola	22.6	290	180	0
Paris	22.7	275	165	+12
Mt. Hamilton	23.0	277.4	167	+10
Algiers	23.6	264	152	+22
Pola	23.7	290	179	0
Paris	24.6	285	174	+ 5
Strassburg	26.6	290	178	0
Copenhagen	27.5	315	[203]	[−16]
Munich	27.6	290	178	+ 1
Utrecht	31.6	275	159	+14
Utrecht	April 1.6	275	159	+15
Copenhagen	1.6	310	[194]	[− 9]
Algiers	1.7	269	153	+19
Mt. Hamilton	3.0	287.2	171	+ 5
Utrecht	April 13.5	286°	165°	+10°
Mt. Hamilton	14.0	170	170	+ 6
Kiel	14.5	300	176	+ 1
Pulkova	15.4	300	174	+ 2
Mt. Hamilton	18.0	303.6	178	+ 1
Mt. Hamilton	19.0	298.2	169	+ 7
Utrecht	20.5	287	159	+12
Utrecht	21.5	291	162	+10
Mt. Hamilton	22.0	299.5	170	+ 5
Utrecht	23.6	289	159	+13
Mt. Hamilton	24.0	306	176	+ 3
Utrecht	24.6	298	164	+12
Utrecht	27.6	298	164	+12
Copenhagen	May 11.4	340	[199]	[−21]
Utrecht	11.5	314	173	+17

The axis of the tail was evidently measurably different in direction from the radius vector produced.

Numerous observations were made on the apparent brightness of the comet. Neglecting indefinite estimates of relative brightness on different nights, 88 estimates were made of the brigthness of the comet as a whole (Wahrnehmbarkeit), and 67 of the star-like nucleus. Data for the determination of the laws governing the increase and decrease of light in comets will always be best secured from comets small enough to render possible estimates of relative brightness which will approach similar comparisons on stars in accuracy and which at the same time afford a consider-

able range in distance from the sun and from the earth. As the brightness of Comet 1898 I had a range of over ten magnitudes (6.5 to 16.7) during the nine months of its apparition period, during which time its radius vector varied in length from 1.1 to 3.5 units, it forms a good test for the applicability of the various formulae which have been suggested.

The estimates were carefully plotted for the comet as a whole and for the nucleus separately, and curves drawn for the different formulae assuming the brightness on March 20 (T = March 17) as the unit. The loss of light in the nebulosity as a whole and in the nucleus seems to have been entirely synchronous and to have obeyed the same law within the limits of observation, but neither comet nor nucleus follow in the slightest degree the formulae $\mathcal{F} = \frac{C}{r^2}$ (Deichmüller, A. N. 3123), $\mathcal{F} = \frac{C}{\Delta^2}$ (Olbers, B.J. 1819) nor the commonly accepted one, $\mathcal{F} = \frac{C}{r^2 \Delta^2}$, the difference O—C on Nov. 15th for the last expression being nearly seven magnitudes.

In the following tables are collected the separate results for the comet and the nucleus. The first column gives the place of observation, the second the Greenwich date, the third the observed magnitude. In the fourth column are given the residuals, in the sense O—C, between the observed magnitude and the relative magnitude computed from the ordinarily accepted formula $\mathcal{F} = \frac{C}{r^2 \Delta^2}$. From the graphical construction I have here assumed that the brightness of the comet on March 20 was $6^m.5$, and the nucleus $8^m.0$.

The attempt was made to ascertain whether the variation of the light of the comet could be expressed in the form $\mathcal{F} = \frac{C}{\varphi(r)\,\Delta^2}$. The various formulae were applied to several comets of long apparition period. While in nearly all these cases the inadequacy of the expression $\mathcal{F} = \frac{C}{r^2 \Delta^2}$ is manifest, no simple function of the inverse of r and Δ will harmonize all the available data. Though it is evident that the purely empirical formula $\mathcal{F} = \frac{C}{r^7 \Delta^2}$ will fall far short of satisfying the observed magnitudes of most comets, it may be of interest to note the comparatively small residuals in both comet and nucleus which are secured in the case of this particular comet. Accordingly in column five I have placed the residuals, in magnitudes, secured on the assumption that the intensity varied in accordance with the above expression.

In this connection it will be in place to note the variations in the diameter of the coma. While no accurate measurements were taken, from the visual estimates made by various observers the apparent diameter of the comet varied from about 2′ of arc at discovery to 10″ at the time of the last observation in November. This corresponds to a shrinkage in diameter from 84000 to 12000 miles.

a. Comet.

Place of Observation	1898	Mg.	O—C $C : r^2 \Delta^2$	O—C $C : r^7 \Delta^2$
Mt. Hamilton	Mar. 20.0	6.0	−0.5	−0.5
Vienna	21.6	6.7	+0.2	+0.3
Vienna	21.6	6.8	+0.3	+0.3
Mt. Hamilton	22.0	6.0	−0.5	−0.5
Vienna	23.6	6.7	+0.2	+0.2
Vienna	26.6	6.7	+0.2	+0.2
Arcetri	26.7	7.8	+1.3	+1.2
Vienna	27.6	6.1	−0.4	−0.5
Kremsmünster	27.6	7	+0.5	+0.4
Munich	27.6	6.5	0.0	−0.1
Heidelberg	28.6	6.5	0.0	−0.1
Vienna	28.6	5.7	−0.8	−0.9
Kremsmünster	28.6	8	+1.5	+1.4
Leipzig	28.6	7	+0.5	+0.4
Munich	28.6	7.0	+0.5	+0.4
Utrecht	31.6	7	+0.4	+0.4
Kremsmünster	31.6	8	+1.4	+1.4
Vienna	31.6	5.6	−1.0	−1.0
Utrecht	April 1.6	7	+0.4	+0.4
Padua	4.6	8	+1.4	+1.2
Vienna	5.5	6.0	−0.6	−0.8
Munich	5.6	6.5	−0.1	−0.3
Strassburg	5.6	9	+2.4	+2.2
Kremsmünster	5.6	9.0	+2.4	+2.4
Utrecht	April 6.6	7.0	+0.3	+0.2
Munich	7.6	7.0	+0.3	+0.2
Kremsmünster	7.6	9	+2.3	+2.2
Vienna	8.5	6.4	−1.3	−0.5
Munich	8.6	7.0	+0.3	+0.1
Vienna	11.5	6.4	−1.3	−0.5
Utrecht	13.5	7.1	+0.4	+0.1
Vienna	14.5	6.3	−0.4	−0.8
Strassburg	14.5	9	+2.3	+1.9
Vienna	16.5	6.4	−0.4	−0.7
Mt. Hamilton	18.0	6.0	−0.9	−1.3
Utrecht	20.5	6.9	0.0	−0.4
Utrecht	23.6	7.4	+0.5	0.0
Mt. Hamilton	24.0	6.0	−0.9	−1.4
Utrecht	24.6	7.5	+0.6	+0.1
Pulkova	25.4	9.5	+2.5	+1.9
Munich	25.5	7.5	+0.5	−0.1
Vienna	26.5	6.8	−0.3	−0.9
Vienna	27.5	6.8	−0.3	−0.9
Vienna	30.5	7.3	+0.1	−0.5
Vienna	May 1.5	7.4	+0.2	−0.5
Munich	2.4	8.5	+1.3	+0.5
Arcetri	9.6	8.5	+1.0	−0.2
Utrecht	11.5	7.8	+0.3	−1.0

Place of Observation	1898	Mg.	O—C $C:r^2\Delta^2$	O—C $C:r^7\Delta^2$
Munich	May 14.4	8.5	+0.9	−0.5
Vienna	14.5	7.8	+0.2	−1.2
Vienna	15.5	8.0	+0.3	−1.0
Munich	15.5	8.5	+0.8	−0.5
Vienna	16.5	7.9	+0.2	−1.1
Vienna	18.5	7.9	+0.1	−1.4
Munich	18.5	9.0	+1.2	−0.3
Hamburg	21.5	11.0	+3.1	+1.5
Vienna	21.5	8.6	+0.7	−0.9
Arcetri	21.6	9.5	+1.6	0.0
Vienna	22.5	8.6	+0.6	−1.0
Utrecht	22.5	9.3	+1.4	−0.3
Munich	22.5	10.0	+2.1	+0.5
Vienna	23.5	8.5	+0.5	−1.0
Munich	25.3	10.0	+2.0	+0.2
Vienna	25.5	8.6	+0.6	−1.2
Munich	June 4.4	10.3	+2.1	0.0
Vienna	8.5	9.5	+1.2	−1.2
Arcetri	12.5	11	+2.6	+0.1
Mt. Hamilton	19.9	10	+1.4	−1.2
Munich	21.5	10.7	+2.0	−0.6
Arcetri	June 25.5	12.5	+3.7	+0.9
Munich	July 16.5	12.0	+2.9	−0.6
Mt. Hamilton	16.9	12.0	+2.9	−0.6
Mt. Hamilton	17.9	12.3	+3.1	−0.5
Munich	18.5	12.2	+3.0	−0.6
Mt. Hamilton	18.9	11.8	+2.6	−1.0
» »	23.0	12.8	+3.6	−0.2
» »	23.9	12.5	+3.3	−0.5
» »	28.0	12.8	+3.5	−0.4
» »	30.0	13	+3.6	−0.2
» »	Aug. 12.9	13.5	+4.0	−0.3
» »	14.0	14	+4.5	+0.1
» »	21.0	15	+5.4	+0.8
» »	25.0	14	+4.3	−0.2
» »	Sept. 10.0	16	+6.2	+1.3
» »	18.0	16	+6.2	+1.0
» »	18.9	15.8	+6.0	+0.8
» »	Nov. 6.8	16.8	+6.8	+0.4
» »	8.9	16.8	+6.8	+0.4
» »	15.8	16.8	+6.7	+0.5

b. Nucleus.

Place of Observation	1898	Mg.	O—C $C:r^2\Delta^2$	O—C $C:r^7\Delta^2$
Vienna	Mar. 21.6	9.5	+1.5	+1.5
Paris	21.6	6.5	−1.5	−1.5
Hamburg	21.6	6.5	−1.5	−1.5
Liverpool	21.7	8	0.0	0.0
Bamberg	22.6	8.9	+0.9	+0.9
Pola	22.6	7.5	−0.5	−0.5
Paris	22.6	7	−1.0	−1.0
Padua	22.6	7.5	−0.5	−0.5
Bordeaux	22.6	7.5	−0.5	−0.5
Arcetri	22.6	7	−1.0	−1.0
Algiers	23.6	8	0.0	−0.1
Strassburg	26.6	7	−1.0	−1.1
Leipzig	28.6	9.2	+1.2	+1.1
Heidelberg	28.6	7.5	−0.5	−0.6
Mt. Hamilton	30.0	8.0	0.0	−0.2
Strassburg	30.6	9	+1.0	+0.8
Utrecht	31.6	9	+0.9	+0.8
Hamburg	31.6	7.5	−0.6	−0.7
Utrecht	April 1.6	8.5	+0.4	+0.3
Hamburg	2.6	8	−0.1	−0.2
Kiel	5.6	7	−1.2	−1.3
Strassburg	5.6	10	+1.8	+1.7
Utrecht	6.6	8.5	+0.3	+0.1
Kremsmünster	6.6	9	+0.8	+0.6
Padua	7.6	8	−0.2	−0.4
Mt. Hamilton	8.0	9.1	+0.9	+0.7
» »	12.0	9.3	+1.0	+0.8
Utrecht	13.5	9.0	+0.7	+0.4
Hamburg	14.6	8.5	+0.2	−0.1
Mt. Hamilton	18.0	9.5	+1.1	+0.7
Kremsmünster	April 19.6	10	+1.6	+1.2
Utrecht	20.5	9	+0.5	+0.2
Mt. Hamilton	22.0	9.6	+1.1	+0.7
» »	23.0	9.0	+0.5	0.0
Utrecht	23.6	9.0	+0.4	0.0
Mt. Hamilton	25.0	9.5	+0.9	+0.4
Hamburg	25.6	8.7	+0.1	−0.4
»	26.5	8.0	−0.7	−1.2
Mt. Hamilton	27.0	9.5	+0.8	+0.3
Copenhagen	27.5	8	−0.7	−1.2
Kremsmünster	30.6	10	+1.3	+0.6
Utrecht	May 1.5	9.3	+0.6	−0.2
Kremsmünster	2.6	10.3	+1.5	+0.7
Mt. Hamilton	5.9	10	+1.2	+0.1
Copenhagen	11.5	9	−0.1	−0.3
Utrecht	11.5	9.5	+0.4	+0.2
Strassburg	13.4	10	+0.8	−0.5
Mt. Hamilton	16.9	11	+1.8	+0.3
» »	19.9	11	+1.7	0.0
Strassburg	20.5	11	+1.7	0.0
Kremsmünster	20.6	10.3	+1.0	−0.7
Utrecht	22.5	12 ?	+2.6	+0.8
Mt. Hamilton	29.9	11	+1.4	−0.7
» »	June 6.0	11.5	+1.7	−0.6
» »	9.9	12.8	+3.0	+1.3
» »	11.9	12.5	+2.6	+0.1
» »	12.9	11.5	+1.6	−0.9
» »	14.9	12	+2.0	−0.5
» »	23.0	13	+2.8	0.0
» »	28.9	13.3	+2.9	0.0

Place of Observation	1898	Mg.	O—C $C:r^2\Delta^2$	O—C $C:r^7\Delta^2$
Mt. Hamilton	July 10.0	14	+3.5	+0.3
Strassburg	15.5	12.5	+1.9	−1.6
Mt. Hamilton	18.9	14	+3.3	−0.3
» »	23.9	14	+3.3	−0.5
» »	30.0	16	+5.2	+1.3

Place of Observation	1898	Mg.	O—C $C:r^2\Delta^2$	O—C $C:r^7\Delta^2$
Mt. Hamilton	Aug. 14.9	16.5	+5.4	+1.1
» »	25.0	17 ?	+5.8	+1.3
» »	Sept. 18.0	17 ?	+5.7	+0.6
» »	Oct. 14.9	16.5	+5.1	+0.3

§ 3. Provisional Elements.

Elliptical elements were computed by Perrine, Ristenpart, Berberich and Pokrowsky, and others. As my own set of elements (A. J. No. 456) from four normal places represented the last observations of Perrine quite closely it was decided to use these as the basis of the definitive determination. These elements are:

T = 1898 March 17.18952, Gr. M. T.
ω = 47° 18′ 20″.17
Ω = 262 26 3.57 } 1898.0
i = 72 31 55.78
$\log q$ = 0.0394588
e = 0.9799213
$\log a$ = 1.7367182
Period = 402.8 years

Constants for the equator of 1898.0.

$x = [9.5123975]\, r \cdot \sin(v + 23° 26′ 14″.18)$
$y = [9.9999960]\, r \cdot \sin(v + 292\ 43\ 47.54)$
$z = [9.9757034]\, r \cdot \sin(v + 22\ 38\ 46.03)$

§ 4. Ephemeris.

From these elements the following ephemeris was computed for Gr. M. T. with seven place logarithms, at intervals of 12^h till July 1st and for 24^h after that date.

1898	α	δ	$\log \Delta$	Aberr.-t.
Mar. 17.5	$21^h\ 9^m 36^s.65$	+14° 5′ 49″.2	0.20295	
18.0	11 22.10	14 36 56.5	20238	$13^m 13^s.3$
18.5	13 8.23	15 8 5.8	20191	
19.0	14 55.01	15 39 16.7	20143	
19.5	16 42.45	16 10 28.9	20099	
20.0	18 30.57	16 41 41.8	20058	13 10.0
20.5	20 19.36	17 12 55.3	20020	
21.0	22 8.83	17 44 8.7	19985	
21.5	23 59.01	18 15 21.7	19941	
22.0	25 49.88	18 46 34.0	19926	13 7.6
22.5	27 41.47	19 17 45.0	19900	
23.0	29 33.77	19 48 54.3	19879	
23.5	31 26.79	20 20 1.5	19861	
24.0	33 20.54	20 51 6.1	19846	13 6.1
24.5	35 15.03	21 22 7.8	19835	
25.0	37 10.27	21 53 6.1	19826	
25.5	39 6.26	22 24 0.5	19822	
26.0	41 3.00	22 54 50.5	19820	13 5.7
26.5	43 0.51	23 25 35.8	19822	
27.0	44 58.79	23 56 15.9	19828	
27.5	46 57.84	24 26 50.5	19836	
28.0	48 57.67	24 57 18.9	19849	13 6.2
28.5	50 58.29	25 27 40.8	19864	
29.0	52 59.70	25 57 55.8	19883	
29.5	55 1.91	26 28 3.4	19905	
30.0	57 4.93	26 58 3.2	19931	13 7.6
30.5	21 59 8.75	27 27 54.8	19950	
31.0	22 1 13.37	27 57 37.7	19992	
31.5	22 3 18.81	+28 27 11.6	0.20028	

1898	α	δ	$\log \Delta$	Aberr.-t.
April 1.0	$22^h\ 5^m 25^s.08$	+28° 56′ 36″.0	0.20067	$13^m 10^s.1$
1.5	7 32.17	29 25 50.4	20109	
2.0	9 40.08	29 54 54.6	20154	
2.5	11 48.82	30 23 48.2	20203	
3.0	13 58.38	30 52 30.5	20254	13 13.6
3.5	16 8.78	31 21 1.5	20309	
4.0	18 20.02	31 49 20.7	20367	
4.5	20 32.10	32 17 27.7	20428	
5.0	22 45.01	32 45 22.2	20492	13 17.9
5.5	24 58.75	33 13 3.7	20559	
6.0	27 13.34	33 40 32.0	20629	
6.5	29 28.76	34 7 46.8	20702	
7.0	31 45.02	34 34 47.7	20778	13 23.2
7.5	34 2.12	35 1 34.4	20857	
8.0	36 20.05	35 28 6.6	20938	
8.5	38 38.81	35 54 24.1	21022	
9.0	40 58.39	36 20 26.4	21108	13 29.3
9.5	43 18.80	36 46 13.4	21199	
10.0	45 40.03	37 11 44.8	21291	
10.5	48 2.08	37 37 0.2	21386	
11.0	50 24.93	38 1 59.6	21483	13 36.3
11.5	52 48.59	38 26 42.7	21582	
12.0	55 13.05	38 51 9.2	21685	
12.5	22 57 38.29	39 15 18.9	21789	
13.0	23 0 4.31	39 39 11.6	21896	13 44.1
13.5	2 31.11	40 2 47.0	22004	
14.0	4 58.67	40 26 5.1	22116	
14.5	7 26.99	40 49 5.7	22229	
15.0	23 9 56.04	+41 11 48.6	0.22345	13 52.7

1898	α	δ	log Δ	Aberr.-t.
April 15.5	$23^h 12^m 25^s.83$	$+41° 34' 13''.6$	0.22461	
16.0	14 56.34	41 56 20.6	22580	
16.5	17 27.56	42 18 9.4	22702	
17.0	19 59.47	42 39 40.0	22824	$14^m 1^s.9$
17.5	22 32.06	43 0 52.4	22949	
18.0	25 5.32	43 21 46.3	23076	
18.5	27 39.23	43 42 21.5	23204	
19.0	30 13.78	44 2 38.2	23334	14 11.9
19.5	32 48.96	44 22 36.2	23465	
20.0	35 24.74	44 42 15.4	23598	
20.5	38 1.10	45 1 35.9	23732	
21.0	40 38.04	45 20 37.5	23867	14 22.4
21.5	43 15.52	45 39 20.2	24005	
22.0	45 53.55	45 57 44.0	24143	
22.5	48 32.08	46 15 49.0	24283	
23.0	51 11.10	46 33 35.1	24424	14 33.5
23.5	53 50.59	46 51 2.2	24566	
24.0	56 30.53	47 8 10.5	24709	
24.5	23 59 10.90	47 24 59.9	24853	
25.0	0 1 51.68	47 41 30.5	24998	14 45.2
25.5	4 32.84	47 57 42.3	25144	
26.0	7 14.36	48 13 35.4	25291	
26.5	9 56.22	48 29 9.8	25439	
27.0	12 38.39	48 44 25.6	25588	14 57.3
27.5	15 20.85	48 59 22.9	25739	
28.0	18 3.57	49 14 1.7	25888	
28.5	20 46.54	49 28 22.2	26038	
29.0	23 29.71	49 42 24.4	26190	15 9.8
29.5	26 13.07	49 56 8.4	26342	
30.0	28 56.60	50 9 34.4	26494	
30.5	31 40.27	50 22 42.4	26648	
May 1.0	34 24.05	50 35 32.7	26801	15 22.7
1.5	37 7.91	50 48 5.2	26955	
2.0	39 51.83	51 0 20.2	27109	
2.5	42 35.79	51 12 17.9	27264	
3.0	45 19.75	51 23 58.3	27419	15 35.9
3.5	48 3.70	51 35 21.6	27575	
4.0	50 47.61	51 46 28.0	27730	
4.5	53 31.44	51 57 17.5	27886	
5.0	56 15.18	52 7 50.5	28042	15 49.4
5.5	0 58 58.78	52 18 7.0	28198	
6.0	1 1 42.24	52 28 7.3	28364	
6.5	4 25.54	52 37 51.6	28510	
7.0	7 8.62	52 47 19.9	28667	16 3.2
7.5	9 51.48	52 56 32.5	28823	
8.0	12 34.08	53 5 29.6	28979	
8.5	15 16.41	53 14 11.4	29136	
9.0	17 58.43	53 22 38.1	29292	16 17.1
9.5	20 40.12	53 30 49.8	29447	
10.0	23 21.46	53 38 46.8	29603	
10.5	26 2.42	53 46 29.3	29759	
11.0	28 42.98	53 53 57.5	29915	16 31.2
11.5	31 23.11	54 1 11.5	30070	
12.0	34 2.79	54 8 11.6	30225	
12.5	36 42.00	54 14 58.0	30380	
13.0	1 39 20.72	$+54$ 21 31.0	0.30534	16 45.5

1898	α	δ	log Δ	Aberr.-t.
May 13.5	$1^h 41^m 58^s.92$	$+54° 27' 50''.6$	0.30688	
14.0	44 36.58	54 33 57.1	30842	
14.5	47 13.69	54 39 50.8	30996	
15.0	49 50.22	54 45 31.9	31150	$16^m 59^s.8$
15.5	52 26.15	54 51 0.5	31302	
16.0	55 1.46	54 56 16.9	31454	
16.5	1 57 36.14	55 1 21.3	31606	
17.0	2 0 10.17	55 6 13.8	31757	17 14.2
17.5	2 43.54	55 10 54.7	31908	
18.0	5 16.21	55 15 24.4	32058	
18.5	7 48.17	55 19 42.7	32208	
19.0	10 19.43	55 23 50.1	32358	17 28.6
19.5	12 49.93	55 27 46.8	32506	
20.0	15 19.69	55 31 32.9	32655	
20.5	17 48.68	55 35 8.6	32802	
21.0	20 16.90	55 38 34.2	32950	17 43.0
21.5	22 44.33	55 41 49.8	33096	
22.0	25 10.96	55 44 55.7	33242	
22.5	27 36.77	55 47 52.1	33387	
23.0	30 1.76	55 50 39.0	33532	17 57.3
23.5	32 25.91	55 53 16.8	33676	
24.0	34 49.21	55 55 45.6	33819	
24.5	37 11.65	55 58 5.7	33962	
25.0	39 33.23	56 0 17.2	34103	18 11.6
25.5	41 53.94	56 2 20.2	34245	
26.0	44 13.76	56 4 15.0	34385	
26.5	46 32.70	56 6 1.8	34525	
27.0	48 50.75	56 7 40.6	34664	18 25.8
27.5	51 7.90	56 9 11.8	34803	
28.0	53 24.15	56 10 35.4	34940	
28.5	55 39.49	56 11 51.8	35078	
29.0	2 57 53.91	56 13 1.0	35213	18 39.9
29.5	3 0 7.42	56 14 3.2	35349	
30.0	2 20.02	56 14 58.6	35483	
30.5	4 31.69	56 15 47.3	35617	
31.0	6 42.44	56 16 29.6	35750	18 53.8
31.5	8 52.27	56 17 5.4	35882	
June 1.0	11 1.17	56 17 35.1	36014	
1.5	13 9.15	56 17 58.8	36145	
2.0	15 16.21	56 18 16.6	36275	19 7.6
2.5	17 22.33	56 18 28.7	36404	
3.0	19 27.53	56 18 35.2	36532	
3.5	21 31.80	56 18 36.3	36659	
4.0	23 35.16	56 18 32.1	36786	19 21.2
4.5	25 37.59	56 18 22.9	36912	
5.0	27 39.10	56 18 8.6	37037	
5.5	29 39.69	56 17 49.5	37161	
6.0	31 39.35	56 17 25.6	37284	19 34.6
6.5	33 38.11	56 16 57.2	37407	
7.0	35 35.95	56 16 24.3	37528	
7.5	37 32.88	56 15 47.0	37649	
8.0	39 28.90	56 15 5.6	37769	19 47.8
8.5	41 24.02	56 14 20.1	37888	
9.0	43 18.23	56 13 30.6	38006	
9.5	45 11.55	56 12 37.3	38125	
10.0	3 47 3.98	$+56$ 11 40.2	0.38240	20 0.7

1898	α	δ	log Δ	Aberr.-t.
June 10.5	$3^h 48^m 55^s.52$	$+56° 10' 39''.5$	0.38355	
11.0	50 46.17	56 9 35.3	38470	
11.5	52 35.93	56 8 27.7	38584	
12.0	54 24.82	56 7 16.8	38697	$20^m 13^s.4$
12.5	56 12.85	56 6 2.7	38809	
13.0	58 0.00	56 4 45.5	38920	
13.5	3 59 46.28	56 3 25.3	39030	
14.0	4 1 31.71	56 2 2.2	39140	20 25.8
14.5	3 16.29	56 0 36.4	39248	
15.0	5 0.02	55 59 7.8	39356	
15.5	6 42.90	55 57 36.7	39462	
16.0	8 24.94	55 56 3.0	39568	20 38.0
16.5	10 6.16	55 54 26.9	39673	
17.0	11 46.55	55 52 48.4	39777	
17.5	13 26.11	55 51 7.7	39880	
18.0	15 4.84	55 49 24.8	39981	20 49.8
18.5	16 42.76	55 47 39.8	40084	
19.0	18 19.88	55 45 52.7	40184	
19.5	19 56.19	55 44 3.7	40284	
20.0	21 31.69	55 42 12.9	40382	21 1.4
20.5	23 6.41	55 40 20.2	40490	
21.0	24 40.34	55 38 25.8	40577	
21.5	26 13.48	55 36 29.8	40673	
22.0	27 45.85	55 34 32.1	40768	21 12.7
22.5	29 17.45	55 32 32.8	40862	
23.0	30 48.28	55 30 32.0	40955	
23.5	32 18.34	55 28 29.9	41047	
24.0	33 47.65	55 26 26.4	41139	21 23.6
24.5	35 16.22	55 24 21.6	41229	
25.0	36 44.04	55 22 15.6	41319	
25.5	38 11.12	55 20 8.4	41408	
26.0	39 37.47	55 18 0.0	41496	21 34.2
26.5	41 3.09	55 15 50.5	41582	
27.0	42 27.99	55 13 40.1	41669	
27.5	43 52.19	55 11 28.7	41754	
28.0	45 15.68	55 9 16.3	41838	21 44.4
28.5	46 38.46	55 7 3.0	41922	
29.0	48 0.54	55 4 48.9	42004	
29.5	49 21.94	55 2 34.0	42086	
30.0	4 50 42.65	$+55$ 0 18.5	0.42167	21 54.3
June 29.5	4 49 21.94	$+55$ 2 34.0	0.42086	
30.5	52 2.69	54 58 2.3	42246	
July 1.5	54 40.74	54 53 27.9	42404	22 1.5
2.5	57 16.15	54 48 51.3	42557	
3.5	4 59 48.94	54 44 12.8	42708	22 10.8
4.5	5 2 19.17	54 39 32.8	42854	
5.5	4 46.87	54 34 51.5	42998	22 19.7
6.5	7 12.08	54 30 9.2	43138	
7.5	9 34.84	54 25 26.2	43274	22 28.3
8.5	11 55.19	54 20 42.8	43407	
9.5	14 13.18	54 15 59.1	43536	22 36.4
10.5	16 28.82	54 11 15.6	43662	
11.5	18 42.16	54 6 32.4	43785	22 44.2
12.5	20 53.23	54 1 49.6	43904	
13.5	5 23 2.06	$+53$ 57 7.6	0.44020	22 51.6

1898	α	δ	log Δ	Aberr.-t.
July 14.5	$5^h 25^m 8^s.67$	$+53° 52' 26''.5$	0.44132	
15.5	27 13.09	53 47 46.7	44242	$22^m 58^s.7$
16.5	29 15.35	53 43 8.1	44347	
17.5	31 15.47	53 38 31.0	44450	23 5.3
18.5	33 13.48	53 33 55.7	44549	
19.5	35 9.38	53 29 22.1	44644	23 11.5
20.5	37 3.21	53 24 50.4	44737	
21.5	38 54.98	53 20 20.8	44826	23 17.3
22.5	40 44.73	53 15 53.5	44912	
23.5	42 32.46	53 11 28.5	44994	23 22.8
24.5	44 18.21	53 7 5.8	45074	
25.5	46 1.99	53 2 45.7	45150	23 27.8
26.5	47 43.83	52 58 28.2	45223	
27.5	49 23.75	52 54 13.5	45293	23 32.4
28.5	51 1.76	52 50 1.7	45360	
29.5	52 37.88	52 45 52.8	45424	23 36.7
30.5	54 12.13	52 41 46.9	45485	
31.5	55 44.51	52 37 44.1	45542	23 40.6
Aug. 1.5	57 15.05	52 33 44.6	45597	
2.5	5 58 43.76	52 29 48.5	45649	23 44.0
3.5	6 0 10.65	52 25 55.7	45697	
4.5	1 35.73	52 22 6.3	45743	
5.5	2 59.01	52 18 20.4	45786	
6.5	4 20.50	52 14 38.2	45825	23 49.8
7.5	5 40.22	52 10 59.7	45862	
8.5	6 58.17	52 7 24.8	45896	
9.5	8 14.36	52 3 53.8	45927	
10.5	9 28.78	52 0 26.8	45955	23 54.1
11.5	10 41.44	51 57 3.7	45980	
12.5	11 52.34	51 53 44.6	46002	
13.5	13 1.48	51 50 29.6	46022	
14.5	14 8.86	51 47 18.7	46038	23 56.9
15.5	15 14.48	51 44 12.0	46052	
16.5	16 18.32	51 41 9.4	46063	
17.5	17 20.39	51 38 11.1	46072	
18.5	18 20.69	51 35 17.0	46078	23 58.2
19.5	19 19.21	51 32 27.2	46081	
20.5	20 15.95	51 29 41.5	46081	
21.5	21 10.93	51 27 0.1	46079	
22.5	22 4.12	51 24 23.0	46074	23 58.1
23.5	22 55.53	51 21 50.1	46068	
24.5	23 45.15	51 19 21.5	46058	
25.5	24 32.98	51 16 57.3	46046	
26.5	25 19.02	51 14 37.3	46031	23 56.6
27.5	26 3.26	51 12 21.5	46015	
28.5	26 45.69	51 10 10.0	45995	
29.5	27 26.29	51 8 2.8	45974	
30.5	28 5.08	51 5 59.8	45950	23 53.9
31.5	28 42.04	51 4 0.9	45924	
Sept. 1.5	29 17.16	51 2 6.3	45896	
2.5	29 50.44	51 0 15.8	45866	
3.5	30 21.86	50 58 29.5	45833	23 50.1
4.5	30 51.41	50 56 47.4	45798	
5.5	31 19.08	50 55 9.3	45762	
6.5	31 44.86	50 53 35.2	45723	
7.5	6 32 8.74	$+50$ 52 5.2	0.45682	23 45.2

1898	α	δ	log Δ	Aberr.-t.
Sept. 8.5	$6^h 32^m 30^s.70$	$+50° 50' 39''.2$	0.45640	
9.5	32 50.71	50 49 17.1	45595	
10.5	33 8.75	50 47 58.8	45549	
11.5	33 24.82	50 46 44.4	45501	$23^m 39^s.2$
12.5	33 38.89	50 45 33.8	45451	
13.5	33 50.94	50 44 26.7	45399	
14.5	34 0.95	50 43 23.1	45346	
15.5	34 8.91	50 42 22.8	45292	23 32.4
16.5	34 14.81	50 41 25.8	45235	
17.5	34 18.63	50 40 31.9	45178	
18.5	34 20.36	50 39 41.0	45119	
19.5	34 19.97	50 38 53.0	45058	23 24.8
20.5	34 17.46	50 38 7.6	44997	
21.5	6 34 12.80	+50 37 24.7	0.44934	
Oct. 5.5	6 29 15.00	+50 30 1.0	0.43978	22 50.3
6.5	28 36.62	50 29 31.4	43907	
7.5	27 55.89	50 29 0.5	43837	
8.5	27 12.81	50 28 28.2	43767	
9.5	26 27.37	50 27 54.1	43697	22 41.5
10.5	25 39.57	50 27 17.7	43627	
11.5	24 49.39	50 26 38.9	43558	
12.5	23 56.85	50 25 57.1	43490	
13.5	23 1.94	50 25 12.0	43423	22 32.9
14.5	6 22 4.68	+50 24 23.2	0.43357	

1898	α	δ	log Δ	Aberr.-t.
Oct. 15.5	$6^h 21^m 5^s.07$	$+50° 23' 30''.2$	0.43291	
16.5	20 3.12	50 22 32.7	43227	
17.5	18 58.86	50 21 30.2	43164	$22^m 24^s.9$
18.5	17 52.28	50 20 22.4	43103	
19.5	16 43.43	50 19 8.6	43043	
20.5	15 32.31	50 17 48.8	42985	
21.5	6 14 18.96	+50 16 22.3	0.42928	22 17.6
Nov. 4.5	5 53 38.66	+49 40 29.1	0.42398	22 1.4
5.5	51 56.84	49 36 31.9	42384	
6.5	50 13.59	49 32 21.5	42373	
7.5	48 28.98	49 27 57.6	42366	
8.5	46 43.10	49 23 19.9	42363	22 0.3
9.5	44 56.02	49 18 28.2	42365	
10.5	43 7.84	49 13 21.9	42370	
11.5	41 18.65	49 8 1.4	42380	
12.5	39 28.54	49 2 25.9	42395	22 1.3
13.5	37 37.61	48 56 35.5	42413	
14.5	35 45.96	48 50 30.0	42437	
15.5	33 53.67	48 44 9.2	42465	
16.5	32 0.86	48 37 33.1	42499	22 4.4
17.5	30 7.63	48 30 41.7	42537	
18.5	28 14.07	48 23 34.9	42580	
19.5	5 26 20.28	+48 16 12.7	0.42628	22 8.4

§ 5. Star Places.

All available catalogues were consulted in the formation of the places of the comparison stars. This was done for the most part at Detroit Observatory, Ann Arbor, Mich., and my thanks are due Director Asaph Hall, jr., for his courtesy in extending to me the privileges of the very complete collection of star-catalogues in the Detroit Observatory Library. A few lacunae were filled from the Lick Observatory Library. In this connection I desire also to express my thanks to Professor R. H. Tucker of Lick Observatory, through whose kind co-operation numerous stars were determined on the Lick Observatory Meridian Circle.

As a rule, the older catalogues were used only to investigate for possible proper motions. Wherever systematic corrections were known to reduce to the Astronomische Gesellschaft system such corrections have been applied. The catalogue places were weighted in accordance with the weights assigned by Dr. H. S. Davis in his paper on the Declinations and Proper Motions of Fifty-six Stars, New York, 1895.

*	α 1898.0	δ 1898.0	Authorities
1	$21^h 18^m 47^s.00$	$+16° 50' 38''.9$	AG. Berl. 8726
2	21 21 42.12	+18 56 1.2	» » 8745, Lal. 41710, Kam 4259, Arm_1 4655, Arm_2 822, M_1, Edinb. 3391, W_2 466, 10 yr. 3580, Saff. 1309, Y_3 9624, Gl_2 1839
3	21 22 32.53	+18 27 22.4	AG. Berl. 8751, Rü. 9188, M_1 28471, W_2 484
4	21 23 27.17	+18 20 26.1	» » 8759, Rü. 9198, M_1 28522
5	21 24 21.26	+18 21 27.4	» » 8763, W_2 535, M_1 28566, M_2 11666
6	21 25 21.17	+18 7 55.7	» » 8767, Rü. 9222, M_1 28610, M_2 11683
7	21 26 21.42	+19 25 7.7	» » 8775, W_2 587, M_1 28665
8	21 26 29.80	+19 50 29.9	» » 8776, W_2 592
9	21 27 2.76	+18 39 51.7	» » 8779, W_2 605, M_1 28712
10	21 29 27.82	+20 28 24.6	» » 8285, W_2 661, M_1 28845
11	21 30 2.84	+19 28 57.8	» » 8802, W_2 674, Rü. 9271, M_1 28873
12	21 31 58.68	+20 27 27.2	BB. VI 4969
13	21 33 12.66	+20 34 47.4	AG. Berl. 8320, W_2 769, Rü. 9313, M_1 29047
14	21 35 6.71	+21 29 40.5	» » 8336, W_2 823, Rü. 9348
15	21 36 20.91	+21 43 54.1	» » 8343, Lal. 42272, W_2 852, M_1 29208
16	21 36 40.65	+21 28 49.7	» » 8344, W_2 861, 863, Lal. 42292, Rü. 9364

*	α 1898.0	δ 1898.0	Authorities
17	$21^h37^m28^s.49$	$+22°34'\ 9''.4$	AG. Berl. 8349
18	21 38 14.27	+22 51 21.5	» » 8354, W_2 898, Rü. 9406, Lal. 42354
19	21 39 16.92	+22 20 55.6	» » 8364, Quet. 9665, W_2 921, Arm_1 4739, Romb. 4955, Lal. 42386, Pi. 262
20	21 40 29.81	+22 55 44.1	» » 8377
21	21 41 22.74	+22 28 42.3	» » 8385, Quet. 9686, Pu. 3179, Gl_2 1877, Romb. 4969, Arm_1 4756, Rü. 9463, W_2 966, Lal. 42451, Pi. 279
22	21 42 30.33	+23 40 21.7	AG. Berl. 8397, Rü. 9482
23	21 43 31.48	+23 59 28.6	» » 8406, Rü. 9500, Arm_2 849, W_2 1021, Lal. 42524
24	21 43 50.27	+23 54 48.8	» » 8409
25	21 45 2.12	+23 36 48.5	» » 8419, Rü. 9530, W_2 1053, Lal. 42572
26	21 45 56.36	+24 32 13.9	» » 8427
27	21 47 39.73	+23 32 2.4	» » 8435, Rü. 9576, W_2 1112, Lal. 42658
28	21 47 58.79	+24 34 32.7	» » 8438, Rü. 9584, Lal. 42665
29	21 48 25.24	+25 26 42.5	AG. Fund. Cat. 518, 16 Pegasi
30	21 49 11.58	+24 52 0.5	AG. Berl. 8446, Rü. 9612, W_2 1145
31	21 49 29.22	+24 56 23.8	» » 8447, Rü. 9619, Gl_2 1893, W_2 1155, Lal. 42714
32	21 50 48.04	+25 26 57.1	» Cambr. 12998, Quet. 9765, Rü. 9646, W_2 1181, Lal. 42754
33	21 50 54.22	+24 33 16.6	» Berl. 8454, Rü. 9649, W_2 1187, Lal. 42757
34	21 51 41.08	+25 57 49.0	» Cambr. 13020, W_2 1214
35	21 53 24.79	+26 3 11.4	» » 13050
36	21 53 52.31	+25 31 29.4	» » 13058
37	21 54 38.14	+26 52 34.0	» » 13071
38	21 56 14.53	+27 33 28.4	» » 13097, W_2 1344
39	21 57 3.35	+25 53 10.1	» » 13113, W_2 1370, Lal. 42972
40	21 58 4.00	+26 12 2.6	» » 13128, BB. VI 4337
41	21 58 12.05	+27 2 38.5	Connected micrometrically with * 42
42	21 58 13.75	+27 7 32.4	AG. Cambr. 13132
43	22 0 49.49	+27 36 38.8	» » 13174
44	22 0 57.32	+28 28 5.2	» » 13175, W_2 1487, Arm_1 4826, Saff. 1424, Y_3 9946, Gl_1 5685, Gl_2 1913, Rü. 9821, Lal. 43102
45	22 2 45.74	+27 56 36.2	AG. Cambr. 13203
46	22 2 50.28	+28 27 52.7	» » 13204
47	22 4 8.13	+28 46 58.7	» » 13221, Rü. 9861
48	22 5 51.74	+28 31 39.7	» » 13239
49	22 6 3.48	+29 28 30.5	» » 13245, BB. VI 4602
50	22 6 19.16	+28 53 40.6	» » 13251, BB. VI 4308
51	22 6 46.00	+28 53 27.4	» » 13259
52	22 8 0.17	+29 42 19.1	» » 13277, W_2 145
53	22 8 39.73	+29 44 28.7	» » 13290, W_2 161
54	22 9 24.11	+31 26 12.2	» Leid. Z. 98, 103, W_2 178
55	22 10 43.99	+30 27 54.9	» » » 1, 2
56	22 11 12.71	+30 48 24.2	» » » 3, 4, W_2 221, Lal. 43474
57	22 11 37.50	+29 32 25.9	» Cambr. 13326, W_2 233
58	22 12 9.44	+29 34 57.5	» » 13334, W_2 243, Lal. 43516
59	22 13 0.83	+30 52 29.8	» Leid. Z. 3, 4
60	22 13 9.87	+30 44 35.3	Connected micrometrically with * 64
61	22 13 14.16	+30 58 49.1	AG. Leid. Z. 6, 114
62	22 13 59.10	+31 30 13.5	» » » 7, 9
63	22 15 41.93	+31 43 45.7	» » » 7, 9, W_2 310
64	22 16 23.33	+30 47 48.4	» » » 98, 103, Arm_1 895, Arm_2 3002, Kam 4484, W_2 326, BB.VI 4685, Ll. 43635
65	22 20 0.34	+31 55 52.9	» » » 7, 9, W_2 395, BB.VI 4689
66	22 20 24.41	+32 16 26.5	» » » 98, 103, Arm_2 3019, Lal. 43786
67	22 20 37.30	+32 21 45.0	» » » 10, 98, 103, BB.VI 4417
68	22 21 0.41	+32 29 16.2	» » » 10, 117, 120
69	22 21 17.26	+31 30 25.1	Connected micrometrically with * 77
70	22 21 40.83	+32 52 25.8	AG. Leid. Z. 98, 103, BB.VI 4422

*	α 1898.0	δ 1898.0	Authorities
71	$22^h21^m45^s.75$	+32° 15′ 44″.8	AG. Leid. Z. 117, 120, W_2 437
72	22 22 43.02	+32 59 43.1	» » » 117, 120, BB. VI 4428
73	22 22 44.42	+32 52 20.8	Connected micrometrically with * 72
74	22 22 49.82	+33 11 49.9	BB. VI 4429
75	22 22 50.99	+33 19 12.7	AG. Leid. Z. 96, 107, 109
76	22 23 0.15	+33 28 47.8	» » » 96, 107, 109, Lal. 43881
77	22 23 5.87	+31 19 6.0	10 yr. 3755, Pu. 3294, Gl_2 1952, Arm_1 4932, W_2 465, Pi. 113
78	22 23 49.97	+33 11 47.3	AG. Leid. Z. 3 obs.
79	22 26 1.21	+33 0 50.8	» » » 2 obs.
80	22 27 6.10	+34 8 28.5	» » » 89, 93, W_2 552, BB. VI 4523, Lal. 44043
81	22 27 52.08	+33 17 19.0	» » » 96, 107, 109, BB. VI 4529
82	22 31 24.50	+34 5 25.9	» » » 96, 109, W_2 654
83	22 31 28.93	+35 57 59.7	» Lund Z. 66, 523
84	22 31 29.72	+35 3 4.6	» Leid. Z. 89, 93, Y_3 10212, Arm_2 3048, Lal. 44195
85	22 31 38.42	+34 7 33.0	» » » 96, 107, 109, W_2 666
86	22 32 10.56	+35 7 24.2	» » » 89, 93, AG. Lund Z. 322, 519, 521, 527, 572, 581, II, IV, W_2 687, Ll. 44221
87	22 32 12.86	+34 36 26.8	» » » 89, 93
88	22 32 35.85	+34 23 57.8	» » » 234, 339
89	22 33 53.86	+35 22 33.2	» Lund Z. 322, 519, 572, 581, II, IV, W_2 734
90	22 34 16.66	+36 8 3.0	» » » 66, 517, 523, 566, VI, VIII, W_2 745
91	22 35 37.89	+35 1 34.1	» » » 519, II, IV
92	22 36 17.28	+36 15 16.0	» » » 357, 358
93	22 36 24.93	+35 43 54.5	BB. VI 4864
94	22 37 10.10	+35 33 37.3	AG. Lund Z. 289, 329, W_2 828
95	22 37 10.54	+35 11 9.7	» » » 322, 519, 521, 717, II, IV, W_2 829
96	22 39 47.76	+35 45 55.0	» » » 523, 572, W_2 894
97	22 40 26.11	+35 47 35.4	» » » 289, 329, W_2 901
98	22 40 50.67	+36 22 45.0	» » » 289, 329
99	22 41 4.23	+35 48 41.7	» » » 66, 581, BB. VI 4878
100	22 43 30.83	+36 52 50.8	» » » 331, 334, Y_3 10313, Arm_1 5024, W_2 967, Pi. 226, Lal. 44642.
101	22 43 50.54	+37 30 6.3	» » » 331, 334
102	22 44 57.96	+35 59 22.6	» » » 289, 329, 556, 717
103	22 45 31.27	+36 9 58.5	» » » 289, 329, 523, 572, 581, VI, VIII
104	22 48 12.83	+38 4 27.2	» » » 345, 347, Gl_2 1995, Arm_2 3089, W_2 1076, Lal. 44786
105	22 50 37.14	+38 2 57.0	Connected micrometrically with * 104
106	22 51 36.41	+38 22 48.1	AG. Lund Z. 44, 47, 528, 534
107	22 52 53.78	+38 50 38.7	» » » 44, 47, 60, Rad_1 5894, Arm_1 5062, Saff. 1564, Y_3 10386, W_2 1174, Lal. 44918, Gro. 3934, Pi. 260
108	22 52 57.96	+38 45 49.0	Y_3 10387, W_2 1176, Quet. 10281, Rad_1 5895, Arm_1 5063, Gro. 3936, Pi. 261, Ed. 3672, Pu. 3364, Saff. 1565, Lal. 44922, Pi. 261
109	22 55 43.33	+38 49 23.6	Connected micrometrically with * 107
110	22 57 47.35	+38 30 14.6	AG. Lund Z. 60, 64
111	22 58 1.18	+39 20 37.4	» » » 528, 534, 44, 47, Lal. 45099
112	22 59 46.11	+39 23 53.1	Tucker, L. O. Mer. C.
113	23 0 58.07	+39 32 21.8	AG. Lund Z. 44, 47, 66, 528, W_2 1347
114	23 1 14.64	+40 3 13.1	» » » 60, 64, 557, 565, W_2 1361
115	23 2 28.00	+40 20 17.1	» Bonn 17456
116	23 2 29.10	+39 59 56.6	» Lund Z. 60, 64, W_2 1383
117	23 3 26.93	+40 28 32.6	» Bonn 17471
118	23 5 43.58	+40 46 16.3	» » 17515, W_2 50
119	23 8 24.28	+40 55 41.1	» » 17554, BB. VI 5017.
120	23 8 46.13	+40 55 6.1	» » 17562
121	23 9 50.89	+40 42 29.5	» » 17584, W_2 150
122	23 12 51.07	+42 1 35.5	» » 17625, W_2 220, Lal. 45621
123	23 14 40.47	+41 51 10.3	Connected micrometrically with * 124
124	23 14 48.08	+41 41 46.2	AG. Bonn 17665, BB. VI 4749

*	α 1898.0	δ 1898.0	Authorities
125	$23^h 15^m 1^s.03$	$+41° 31' 10''.5$	AG. Bonn 17671, Rad_1 6036, Arm_1 5149, Saff. 1618, Boss 487, Edinburg 31, Pu. 3425
126	23 17 26.74	+41 55 2.7	AG. Bonn 17702, W_2 318, Lal. 45786
127	23 18 51.66	+42 35 54.2	» » 17727
128	23 24 56.03	+43 22 44.0	» » 17839, Lal. 46018
129	23 26 21.02	+43 46 37.1	Connected micrometrically with * 132
130	23 27 44.25	+44 5 39.0	AG. Bonn 17898, Rü. 11323, W_2 548
131	23 31 35.94	+44 0 49.9	» » 17950, W_2 631
132	23 32 33.03	+43 51 56.4	Rad_1 6132, Gro. 4105
133	23 33 11.56	+44 30 29.8	AG. Bonn 18030
134	23 34 21.50	+45 9 18.5	» » 18013, BB. VI 4464
135	23 34 51.38	+44 52 43.2	» » 18021
136	23 36 43.99	+45 16 29.1	» » 18054
137	23 37 13.25	+44 25 36.2	» » 18063, Rad_1 6160, Saff. 1664, Gl. 6275, 12 yr. 2123, W_2 773, Ll. 46462
138	23 37 44.37	+44 36 32.9	» » 18074
139	23 38 46.52	+45 21 51.6	» » 18093
140	23 38 58.79	+45 22 8.3	» » 18095
141	23 41 52.50	+45 39 4.0	» » 18147
142	23 42 31.19	+45 39 5.2	» » 18156
143	23 43 30.85	+45 40 52.7	» » 18176
144	23 47 45.66	+45 55 30.5	» » 18231, AOe. 26119
145	23 48 37.04	+46 13 46.4	» » 18244, AOe. 26141
146	23 49 15.62	+46 23 56.9	» » 18252, AOe. 26153, Lal. 46852
147	23 50 12.95	+46 36 42.5	» » 18266
148	23 50 24.67	+46 47 17.8	» » 18274, Harv. 1203, Rad_1 18274, Gro. 4165
149	23 50 56.31	+46 41 3.9	» » 18284
150	23 54 32.20	+47 2 2.6	BD. +46°4226, Boeger and Yowell, Naval. Obs. Mer. C.
151	23 55 11.19	+46 48 22.2	AG. Bonn 18363, AOe. 26274
152	23 56 12.00	+47 22 27.5	» » 18380
153	23 56 50.10	+47 24 3.6	» » 18388, AOe. 26305
154	23 56 58.78	+47 0 33.4	» » 18392
155	23 57 36.56	+47 31 41.5	» » 18402
156	23 57 36.60	+47 30 43.1	AOe. 26326
157	23 57 46.27	+47 9 20.9	AG. Bonn 18407
158	0 0 3.24	+47 54 30.3	» » 18440, Rad_1 6300, Gro. 4224, AOe. 26372
159	0 1 18.78	+47 46 18.0	» » 3, AOe. 26392
160	0 5 24.90	+48 3 41.1	» » 71
161	0 5 29.24	+48 26 35.8	» » 72
162	0 6 38.77	+47 35 4.4	» » 90, Rad_1 16, Gro. 9, Arm_1 17, Saff. 1735, Par_2 125, 10 yr. 19, Lal. 56
163	0 6 42.07	+48 6 41.4	» » 91, BB. VI 22
164	0 7 21.32	+48 33 7.2	» » 102, AOe. 89
165	0 9 2.95	+48 32 43.1	Connected micrometrically with * 164
166	0 12 23.75	+48 45 46.4	AG. Bonn 155
167	0 12 57.59	+48 56 36.9	» » 195, Par_1 268, Par_3 268, Lal. 278
168	0 15 5.32	+48 24 8.7	» » 227, Rad_1 66, Gro. 46, Rü. 48, AOe. 237, Fed. 39
169	0 21 7.14	+50 1 15.9	» » 320
170	0 21 41.65	+49 25 16.3	» » 326, Rad_1 98, Gro. 64, AOe. 362, Arm_1 13, Arm_2 56, Y_3 201, Saff. 1765, $Par_{2,3}$ 493, 7 yr. 27, Fed. 61, Quet. 139, Lal. 558
171	0 23 39.35	+50 2 1.9	Connected with * 169
172	0 25 5.98	+49 50 37.8	AG. Bonn 375
173	0 25 12.61	+49 41 51.2	» » 376, Rad_1 108, AOe. 425
174	0 25 28.99	+49 41 24.2	» » 383, Rad_1 111, Gro. 72, AOe. 432, Fed. 69
175	0 26 59.07	+50 32 26.4	» Cambr. 221
176	0 27 27.68	+49 55 49.8	» Bonn 410
177	0 28 33.65	+50 26 5.0	» Cambr. 235, Rad_1 136, Gro. 92
178	0 30 18.65	+50 31 36.0	Connected micrometrically with * 175

*	α 1898.0	δ 1898.0	Authorities
179	$0^h30^m50^s.75$	+50° 24′ 16″.4	Connected micrometrically with * 177
180	0 31 23.73	+50 7 54.0	AG. Bonn 465, AG. Cambr. 260
181	0 32 44.90	+50 42 30.4	» Cambr. 270, Rad_1 166, Gro. 109, AOe. 562, Par_3 773, Lal. 958, Fed. 97
182	0 33 4.12	+50 49 48.9	» » 272, Rad_1 168, Gro. 110, AOe. 564, Lal. 965, Par_3 783, Fed. 98
183	0 33 27.08	+50 28 1.5	» » 275, AOe. 572
184	0 35 13.78	+50 25 36.1	» » 285, AOe. 609
185	0 40 31.92	+50 59 7.2	» » 329
186	0 40 56.01	+51 7 56.0	» » 331
187	0 43 45.46	+51 23 25.7	» » 359
188	0 44 28.17	+51 6 17.1	» » 362
189	0 45 44.42	+51 1 0.2	» » 370, Rad_1 227, Gro. 155, Arm_1 180, Saff. 1833, Lal. 1381–2, Fed. 132, Pi. 203
190	0 46 58.79	+51 16 14.6	AG. Cambr. 379, AOe. 824
191	0 47 18.23	+51 19 32.3	» » 384, AOe. 832
192	0 48 20.39	+51 34 48.3	Connected micrometrically with * 195
193	0 50 45.37	+51 42 32.9	» » » * 194
194	0 51 25.78	+51 41 18.9	AG. Cambr. 425, Rad_1 269, Gro. 191, BB. VI 193, Lal. 1583, Fed. 149, Pi. 233
195	0 52 0.81	+51 34 33.5	» » 434
196	0 53 1.66	+51 58 7.4	» » 440, BB. VI 202
197	0 55 54.49	+52 3 21.1	Connected micrometrically with * 200
198	0 56 7.24	+52 11 5.4	» » » * 199
199	0 56 40.38	+52 18 8.7	AG. Cambr. 472, AOe. 1008
200	0 58 2.55	+51 57 21.8	» » 486, Harv. 48, 10 yr. 165, AOe. 1035, Lal. 1809
201	1 2 0.15	+52 44 27.3	» » 516, BB. VI 266
202	1 3 56.44	+52 26 17.4	» » 528, AOe. 1154
203	1 6 26.41	+52 39 22.8	» » 549
204	1 6 43.10	+53 1 19.8	» » 552, BB. VI 279
205	1 7 7.65	+52 47 35.0	Connected micrometrically with * 201
206	1 8 52.62	+53 4 17.0	AG. Cambr. 564
207	1 9 31.44	+52 54 10.0	Connected micrometrically with * 206
208	1 14 47.09	+53 9 6.5	AG. Cambr. 603
209	1 14 52.32	+53 9 50.6	» » 606, BB. VI 311
210	1 18 50.67	+53 24 31.1	» » 634
211	1 22 14.61	+53 28 26.6	» » 652
212	1 23 1.94	+53 41 43.9	» » 661, AOe. 1559
213	1 23 48.44	+53 44 19.9	» » 671
214	1 24 0.40	+53 37 14.0	» » 673, AOe. 1575
215	1 24 47.95	+53 36 55.3	» » 677
216	1 25 7.67	+53 42 59.4	» » 678
217	1 26 2.14	+53 57 29.8	» » 683
218	1 26 42.55	+53 44 50.5	» » 691
219	1 31 43.96	+54 4 7.9	» » 726, BB. VI 349
220	1 32 46.82	+54 4 53.9	» » 738, Lal. 2958
221	1 37 39.42	+54 22 23.5	» » 793, Lal. 3120
222	1 42 16.46	+54 26 22.2	» » 826, Rü. 422
223	1 43 49.90	+54 42 38.2	» » 835, Rad_1 529, 10 yr. 279, Lal. 3282, Pi. 173
224	1 43 58.20	+54 26 36.0	» » 838
225	1 44 45.65	+54 25 7.9	» » 849, Rad_1 532, Gro. 385, Rü. 438, Par_1 2266, Par_3 2266, Lal. 3315
226	1 44 59.02	+54 26 19.6	» » 850, Rad_1 533, Gro. 386, Rü. 440, Par_1 2278, Par_3 2278, Lal. 3319
227	1 45 17.22	+54 38 31.8	» » 854, Rad_1 535, Gro. 388, Lal. 3326, Saff. 1976, $Par_{1,2,3}$ 2283, 12 yr. 160, 5 yr. 105, Pu. 257, Pi. 177
228	1 45 43.29	+54 49 36.1	AG. Cambr. 863, Rad_1 536
229	1 51 5.66	+54 52 18.2	» » 908, AOe. 2171
230	1 52 2.06	+55 5 5.9	» » 917, AOe. 2193, Lal. 3565
231	1 55 38.66	+55 7 52.4	» » 943, BB. +55°441
232	1 57 12.69	+55 4 12.7	» » 957, BB. +54°450

*	α 1898.0	δ 1898.0	Authorities
233	$1^h 58^m 9^s.86$	+55° 7′ 59″.6	AG. Cambr. 965, AG. Hels. 1840, Arm_2 267, Lal. 3758
234	2 3 1.11	+55 0 14.2	» » 995
235	2 7 58.20	+55 16 14.8	» » 1037, AG. Hels. 1995
236	2 8 1.32	+55 18 59.8	» » 1038, AG. Hels. 1999
237	2 12 28.02	+55 24 33.7	» Hels. 2105, Y_3 1057, $Rü_2$ 1051
238	2 13 36.94	+55 26 24.1	» » 2126, AOe. 2634
239	2 15 14.49	+55 22 43.5	» » 2168, Harv. 99, Pu. 338, 5 yr. 138, 10 yr. 355, 12 yr. 206, Ed. 403, Y_3 1077, Rü. 593, Arm_1 509, Rad_1 689, Gro. 501, Lal. 4301. Auw.-Br. 326, Pi. 55
240	2 15 27.13	+55 29 2.5	Connected micrometrically with * 239
241	2 15 52.20	+55 36 42.5	AG. Hels. 2181
242	2 17 47.52	+55 32 1.2	Connected micrometrically with * 244
243	2 18 6.63	+54 47 31.2	AG. Cambr. 1117, Rad_1 717
244	2 18 47.40	+55 38 28.0	» Hels. 2226, AOe. 2722
245	2 20 13.49	+55 21 20.3	Connected micrometrically with * 243
246	2 20 46.42	+55 35 8.1	AG. Hels. 2254
247	2 21 10.62	+55 47 44.9	» » 2258
248	2 29 22.35	+55 45 4.7	» » 2365, Lal. 4726
249	2 33 12.02	+55 49 54.4	» » 2409, AOe. 2993
250	2 33 45.59	+55 49 52.7	» » 2420, Par_3 3267, AOe. 3008, Lal. 4857
251	2 36 2.45	+56 4 9.3	» » 2458, AOe. 3054, Lal. 4923
252	2 36 54.03	+55 59 44.1	» » 2474
253	2 41 49.03	+56 8 7.9	» » 2528
254	2 42 43.41	+56 11 27.2	» » 2545, BB. VI. 723
255	2 48 21.60	+56 4 4.6	» » 2618
256	2 49 0.47	+55 56 0.0	» » 2627
257	2 49 1.64	+56 8 40.0	Connected micrometrically with * 255
258	2 53 50.37	+55 58 59.4	AG. Hels. 2691, Lal. 5450
259	2 57 52.57	+56 18 19.0	» » 2737, Quet. 1173, 5 yr. 173, 10 yr. 457, 12 yr. 259, Pu. 432, Ed. 496, Gl_1 702, Arm_1 652, AOe. 3400, Rad_1 860, Gro. 601, Pi. 236
260	3 0 48.76	+56 15 27.6	AG. Hels. 2770, AOe. 3444
261	3 2 48.43	+56 14 25.3	» » 2799
262	3 4 36.12	+56 18 24.2	» » 2824
263	3 9 51.49	+56 9 50.1	» » 2887, BB. VI 802
264	3 10 56.85	+56 16 10.4	» » 2901
265	3 16 22.19	+56 18 51.9	» » 2962
266	3 17 26.38	+56 28 40.3	» » 2977
267	3 18 41.90	+56 18 49.2	Connected micrometrically with * 265
268	3 23 20.93	+56 10 28.6	» » » * 269
269	3 23 58.41	+56 5 31.2	AG. Hels. 3037, Lal. 6364
270	3 24 53.92	+56 4 39.9	» » 3161, AOe. 4012, Lal. 6681
271	3 29 45.02	+56 24 3.8	» » 3098, AOe. 3929
272	3 34 25.98	+56 8 45.0	» » 3154
273	3 38 8.81	+56 2 28.0	» » 3182, Par_3 4381, AOe. 4064, Lal. 6787
274	3 38 38.42	+56 14 11.2	» » 3190
275	3 43 36.16	+56 14 17.5	Connected micrometrically with * 276
276	3 47 17.25	+56 12 11.8	AG. Hels. 3269, AOe. 4325
277	3 51 1.88	+56 16 50.0	» » 3295, BB. VI 865
278	3 52 7.53	+56 8 30.2	» » 3306
279	3 54 15.54	+56 4 10.1	» » 3325, BB. VI 842
280	3 54 29.61	+56 5 57.3	» » 3327, AOe. 4348
281	3 54 46.80	+55 58 7.9	» » 3330, AOe. 4358, Lal. 7320
282	4 1 15.74	+56 9 35.9	» » 3395
283	4 5 17.35	+56 2 35.1	» » 3428
284	4 10 10.57	+55 55 15.7	» » 3466, AOe. 4637
285	4 16 3.81	+55 45 7.3	» » 3522, AOe. 4738
286	4 16 47.81	+55 50 58.5	» » 3528

*	α 1898.0	δ 1898.0	Authorities
287	$4^h\,16^m\,55^s.75$	+55° 51′ 23″.6	AG. Hels. 3530
288	4 23 23.68	+55 39 47.5	» » 3584, AOe. 4858
289	4 25 20.43	+55 36 32.5	» » 3609
290	4 31 36.91	+55 32 9.5	» » 3665
291	4 34 40.81	+55 29 35.4	» » 3696, AOe. 5028
292	4 35 42.97	+55 20 39.1	» » 3708
293	4 37 59.71	+55 27 59.1	» » 3729, Quet. 1810, Arm_1 1010, Lal. 8807
294	4 43 9.71	+55 11 32.4	» » 7373, AG. Cambr. 1975, AOe. 5190
295	4 46 23.48	+55 16 3.4	» » 3790, BB. VI 939, AOe. 5245
296	4 46 42.69	+55 5 26.0	» » 3795, AG. Cambr. 2000, Rad_1 1331, AOe. 5249, Arm_1 1045, Par_1 5554, Pu. 734, Quet. 1867, Lal. 9052, Auw.-Br. 659
297	4 56 19.24	+54 50 38.9	AG. Cambr. 2057, Par_3 5766, AOe. 5415, Lal. 9361
298	5 12 58.17	+54 8 47.8	» » 2146, AOe. 5729, BB. VI 882
299	5 19 30.71	+53 58 19.1	» » 2187, AOe. 5829
300	5 21 8.00	+54 4 4.5	» » 2196, AOe. 5859
301	5 30 28.13	+53 42 9.4	Connected micrometrically with * 303 and 304
302	5 30 40.88	+53 30 25.6	AG. Cambr. 2245
303	5 31 13.78	+53 48 28.9	» » 2250
304	5 31 14.53	+53 48 36.6	» » 2251
305	5 31 47.44	+53 27 53.9	» » 2256
306	5 33 3.69	+53 26 23.7	» » 2262, Rad_1 1524, Gro. 995, Rü. (Nachtrag), Arm_1 1251, Y_3 2394, Romb. 1285, Quet. 2202, Fed. 775, Pi. 146
307	5 33 26.86	+48 41 9.5	Connected micrometrically with * 312
308	5 34 2.73	+53 27 45.4	AG. Cambr. 2268, AOe. 6075
309	5 34 9.88	+53 29 23.7	» » 2270, AOe. 6077
310	5 37 1.33	+48 56 25.6	» Bonn 4687
311	5 38 39.27	+49 5 0.6	» » 4699, AOe. 6166
312	5 38 58.06	+48 37 38.7	» » 4708, AOe. 6170
313	5 40 27.93	+49 6 22.5	Connected micrometrically with * 311
314	5 42 44.51	+53 11 20.8	AG. Cambr. 2315
315	5 43 44.13	+49 18 34.5	» Bonn 4769
316	5 45 55.62	+49 17 52.6	Connected micrometrically with * 315
317	5 47 27.12	+52 57 30.9	AG. Cambr. 2342, Fed. 798
318	5 47 59.39	+49 27 59.1	Connected micrometrically with * 324
319	5 48 18.66	+52 55 18.9	AG. Cambr. 2353, Romb. 1352
320	5 49 6.76	+52 51 3.3	» » 2357, BB. VI. 1014
321	5 49 44.88	+49 28 33.4	Connected micrometrically with * 324
322	5 51 10.88	+52 40 58.7	AG. Cambr. 2368
323	5 52 38.53	+52 42 6.3	Connected micrometrically with * 322
324	5 53 26.95	+49 29 6.8	AG. Bonn 4905
325	5 54 30.29	+52 39 34.5	Connected micrometrically with * 322
326	6 13 5.12	+51 46 4.5	AG. Cambr. 2472, AOe. 6724
327	6 14 6.02	+51 50 30.6	» » 2478, AOe. 6744
328	6 15 11.09	+50 27 32.5	» » 2481
329	6 16 7.88	+50 21 14.1	Connected micrometrically with * 328
330	6 19 32.65	+50 20 57.3	» » » * 331
331	6 20 23.96	+50 20 7.9	AG. Cambr. 2507
332	6 21 42.36	+50 21 55.7	Connected micrometrically with * 331
333	6 21 48.93	+51 26 38.4	AG. Cambr. 2518, AOe. 6894
334	6 24 9.66	+51 17 45.0	BD. +51°1204, Tucker L. O. Mer. C.
335	6 26 23.55	+51 10 13.8	AG. Cambr. 2542, AOe. 6981
336	6 26 56.51	+50 28 21.7	Connected micrometrically with * 337
337	6 28 18.03	+50 29 49.0	BD. +50°1320, Tucker L. O. Mer. C.
338	6 34 8.62	+50 43 23.4	Tucker L. O. Mer. C., AG. Cambr. 2577, BB. VI 1337
339	6 34 11.76	+50 43 34.3	Tucker L. O. Mer. C., AG. Cambr. 2580, BB. VI 1338
340	6 34 35.37	+50 43 18.4	Tucker L. O. Mer. C., AG. Cambr. 2583, BB. VI 1340

The observations of M. V. Baranof, at Kasan, were not published till nearly three years after being made and hence certain of his comparison stars are not included in the above list. These stars are as follows:

*	α 1898.0	δ 1898.0	Authorities
341	$21^h48^m\ 4^s.40$	$+24°\ 22'\ 6''.0$	AG. Berlin 8440
342	22 13 55.75	+31 12 47.9	BD. +31°4676, Tucker L. O. Mer. C.
343	22 53 54.93	+39 14 48.7	BD. +39°4981, Tucker L. O. Mer. C.
344	23 8 14.40	+41 30 27.8	AG. Bonn 17551
345	23 11 12.24	+41 30 40.8	Connected micrometrically with * 344
346	23 26 54.38	+43 30 35.4	AG. Bonn 17880
347	23 52 12.60	+46 43 22.2	» » 18309
348	23 58 28.06	+47 52 7.3	» » 18417
349	0 2 44.70	+47 53 34.9	BD. +47°1, Connected micrometrically with * 348
350	0 9 2.97	+48 32 45.5	BD. +48°46, Tucker L. O. Mer. C.
351	0 48 20.42	+51 34 47.5	BD. +51°180, Tucker L. O. Mer. C.
352	0 58 12.52	+52 19 11.1	AG. Cambr. 488
353	1 12 43.14	+53 14 15.9	» » 590
354	2 1 51.73	+55 12 26.3	BD. +55°520, Tucker L. O. Mer. C.

Perrine had already detected in the course of his reductions, a marked proper motion in δ in star No. 338 of the above list (cf. A. J. No. 459). Proper motion is also suspected in the following stars:

*	Epoch	α 1898.0	δ 1898.0	Assumed proper motion
AG. Hels. 2458	74.5	$2^h36^m2^s.45$	$+56°\ 4'\ 7''.2$	
Lal. 4923	..	2.65	1.5	— $+0''.09$
AOe. 3054	..	2.37	3.6	
AG. Bonn 18440	75.7	0 0 3.04	+47 54 32.5	
Rad_1 6300	51.8	2.73	36.5	$+0^s.009$ $-0''.11$
Gro. 4224	13.9	2.50	36.1	
AOe. 26372	..	2.81	35.7	

§ 6. Comparison with Ephemeris.

In all, the comet was observed 666 times at 34 different observatories. Of these 27 are in right ascension only and 26 in declination; that is, 640 in α and 639 in δ. The parallax factors were recomputed with uniform constants and the value 8''.80 for the sun's parallax. The reductions to apparent place were carefully checked.

The weighting was performed in part graphically. Having plotted the daily means of the residuals in the sense O — C separately for right ascension and declination, a smoothed curve was drawn, which was assumed to represent the true path of the comet.

By comparing the observations with this curve a new set of residuals was formed and corrected for constant error, from which the probable errors of a single observation were computed from the formulae:

$$r = [9.9270]\frac{[+v]}{\sqrt{m(m-1)}} \qquad p = \frac{C^2}{r^2}$$

where $C = 0^s.12$ in α and 1''.8 in δ, being the average probable errors for all the series.

If there were fewer than seven observations by any one observer, weights were arbitrarily assigned.

Where the computed weight was under 0.5 the weight $1/2$ was assigned to the observations; from 0.6 to 1.75 weight 1; from 1.75 to 5, weight 2, and over 5, weight 3.

In the majority of cases the computed constant error was small enough to be negligible. It was deemed advisable, however, to correct the residuals from three observatories as follows:

Observatory	Constant error α	Constant error δ
Algiers	—	+2''.5
Arcetri	$+0^s.37$	—
Washington	—	−3.4

As data concerning the brightness and physical characteristics of the comet are tabulated elsewhere I have included in the following comparison of the observations with the ephemeris only such observing notes as bear directly on the character of the observation.

Algiers. C. Rambaud and F. Sy.

Equatorial coudé, $0^m.318$ aperture. A. N. 3542; C. R. 126.1082; B. A. 16.64.

Rambaud: Prob. error 2″.4, 3″.2; Comp. wt. 0.6, 0.3; Ass. wt. 1, 1/2.

Sy: » » 0.9, 4.5; » » 4, 0.2; » » 2, 1/2.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
Mar. 23.64199	18.10	12	−0.32	+2″.9	21h 31m 58.97	+20° 28′ 51″.8	−0.05	+ 0″.6	R
23.65268	18.10	12	−0.31	+2.8	21 32 1.66	+20 29 25.8	+0.74	− 5.3	S
April 1.64553	18.10	52	−0.34	+2.6	22 8 9.07	+29 34 19.0	−0.22	− 0.1	R
1.65580	18.10	52	−0.33	+2.4	22 8 11.71	+29 34 52.4	−0.21	− 2.5	S
4.68516	9.6	66	−0.33	+1.9	22 21 20.68	+32 27 43.8	−0.46	− 5.5	R
4.68985	9.6	66	−0.32	+1.8	22 21 22.33	+32 27 59.7	−0.11	− 4.8	S
7.63827	15.10	86	−0.36	+2.5	22 34 40.14	+35 8 55.6	−0.03	− 0.5	R
7.65276	15.10	86	−0.35	+2.2	22 34 44.04	+35 9 39.6	−0.11	− 2.8	S
13.64436	10.10	116	−0.37	+2.1	23 3 13.39	+40 9 28.8	−0.18	+ 6.3	S
13.65217	10.10	116	−0.37	+2.0	23 3 15.69	+40 9 53.0	−0.19	− 2.3	R
14.65484	17.10	119	−0.37	+2.0	23 8 13.04	+40 56 0.7	−0.02	− 9.0	R
14.66394	17.10	119	−0.37	+1.8	23 8 15.53	+40 56 31.9	−0.19	− 2.6	S
29.64610	12.10	176	−0.40	+1.8	0 27 1.11	+50 0 4.3	+0.18	− 1.6	R
29.65650	12.10	176	−0.40	+1.6	0 27 4.30	+50 0 20.4	+0.05	− 2.2	S
30.64510	10.10	183	−0.40	+1.8	0 32 27.83	+50 26 23.6	+0.03	− 4.1	S
30.65294	10.10	183	−0.40	+1.7	0 32 30.26	+50 26 38.1	−0.06	− 1.8	R
May 14.33645	12.12	227	−0.17	+3.2	1 46 22.10	+54 37 57.7	−0.15	+ 1.2	R
14.35180	12.12	227	+0.14	+3.1	1 46 26.96	+54 38 16.2	−0.13	+ 8.9	S
24.37670	12.10	251	+0.09	+2.9	2 36 36.84	+55 57 43.0	+0.13	+11.3	S
24.39205	12.10	251	+0.05	+2.8	2 36 42.35	+55 57 45.1	+0.77	+ 8.9	R
25.36378	12.10	253	+0.12	+2.9	2 41 16.01	+56 1 56.9	+0.18	+ 9.4	S
25.38094	12.10	253	+0.08	+2.8	2 41 20.71	+56 2 2.6	+0.11	+10.9	R

Ann Arbor. S. D. Townley.

12 in. equatorial; filar micrometer. A. J. 437.

Prob. error 2″.7, 1″.8; Comp. wt. 0.5, 1.0; Ass. wt. 1/2, 1.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
Mar. 24.92944	8.6	15	−0.27	+2″.9	21h 36m 53.51	+21° 48′ 43″.0	−0.43	+1″.1	T
29.88065	8.6	37	−0.31	+3.2	21 56 35.56	+26 50 49.9	+0.05	−5.5	»
31.88617	10.6	47	−0.31	+3.0	22 4 56.20	+28 49 52.8	−0.17	−4.1	»
April 2.89255	10.8	60	−0.31	+2.8	22 13 30.43	+30 46 18.7	−0.03	−2.6	»
6.88970	10.8	88	−0.32	+2.7	22 31 14.76	+34 28 50.5	−0.11	−0.7	»
11.84381	10.8	108	−0.30	+3.2	22 54 27.94	+38 43 30.5	+0.08	−2.4	»
15.86372	10.8	123	−0.35	+2.8	23 14 15.01	+41 50 14.6	+0.59	+3.0	»

Arcetri. A. Abetti.

$0^m.284$ equatorial, filar micrometer; power 124. A. N. 3486, 3488, 3536.

Prob. error 2″.2, 1″.8; Comp. wt. 0.7, 1.0; Ass. wt. 1, 1.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
Mar. 22.64314	24.16	7	−0.28	+3″.3	21h 28m 13.56	+19° 26′ 43″.3	+0.01	+3″.0	A
22.64314	24.16	11	−0.28	+3.3	21 28 13.64	+19 26 37.9	+0.08	−2.4	»
26.67483	8.4	22	−0.26	+2.8	21 43 41.93	+23 36 20.4	+0.13	+0.6	»
26.67483	8.4	25	−0.26	+2.8	21 43 41.80	+23 36 20.2	+0.01	+0.4	»
27.66380	20.12	26	−0.26	+2.8	21 47 37.15	+24 36 49.9	+0.13	−0.3	»
27.66380	20.12	28	−0.27	+2.8	21 47 37.10	+24 36 48.6	+0.08	−1.6	»
April 7.66024	12.4	84	−0.30	+2.3	22 34 46.24	+35 10 9.4	+0.01	+3.2	»
7.66024	12.4	86	−0.30	+2.3	22 34 46.40	+35 10 5.7	+0.14	−0.5	»

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
April 8.61476	16.12	97	−0ˢ.32	+2″.9	22ʰ39ᵐ10ˢ.81	+36° 0′ 21″.1	+0ˢ.02	− 2″.9	A
8.61476	16.12	96	−0.32	+2.9	22 39 10.90	+36 0 20.4	+0.10	− 3.6	»
13.62559	28.12	114	−0.33	+2.5	23 3 8.50	+40 8 39.7	+0.31	− 0.2	»
13.62559	28.12	116	−0.33	+2.5	23 3 8.60	+40 8 38.1	+0.38	− 1.8	»
May 2.60389	24.12	188	−0.36	+2.4	0 43 10.00	+51 14 41.9	+0.09	− 2.9	»
9.59537	16.8	210	−0.35	+2.4	1 21 11.34	+53 32 22.0	+0.19	+ 0.1	»
9.59537	16.8	211	−0.35	+2.4	1 21 11.41	+53 32 19.1	+0.23	− 2.8	»
10.44264	16.8	213	−0.14	+4.2	1 25 44.83	+53 45 35.9	+0.44	− 1.0	»
10.44264	16.8	216	−0.14	+4.2	1 25 44.53	+53 45 31.3	+0.33	− 5.6	»
13.43067	16.8	227	−0.10	+4.2	1 41 37.61	+54 26 57.4	+0.35	− 1.4	»
13.43067	16.8	225	−0.10	+4.2	1 41 37.46	+54 26 51.0	+0.26	− 7.8	»
15.44342	20.8	229	−0.13	+4.1	1 52 10.39	+54 50 21.8	+1.06	− 2.1	»
15.44342	20.8	230	−0.13	+4.1	1 52 9.71	+54 50 27.3	+0.67	+ 3.4	»
16.42853	16.14	231	−0.09	+4.0	1 57 14.92	+55 0 36.5	+0.52	− 2.0	»
16.42853	16.14	233	−0.09	+4.0	1 57 15.09	+55 0 32.3	+0.62	− 6.2	»
21.56460	24.12	247	−0.31	+2.7	2 23 4.42	+55 42 13.0	+0.61	− 1.3	»
21.56460	24.12	246	−0.31	+2.7	2 23 4.45	+55 42 14.2	+0.63	− 0.1	»
25.34429	24.8	254	+0.10	+3.8	2 41 11.09	+56 1 42.1	+0.49	+ 0.7	»
25.34429	24.8	253	+0.10	+3.8	2 41 10.94	+56 1 40.0	+0.41	− 2.8	»
31.55212	16.8	264	−0.27	+2.8	3 9 7.14	+56 17 2.5	+0.77	− 6.3	»
31.55212	16.8	263	−0.27	+2.8	3 9 7.00	+56 17 5.2	+0.70	− 3.6	»
June 2.56543	8.8	265	−0.29	+2.5	3 17 39.72	+56 18 26.9	+0.46	− 3.0	»
2.56543	6.8	266	−0.29	+2.5	3 17 40.08	+56 18 24.9	+0.66	− 5.0	»
6.56186	24.8	270	−0.28	+2.5	3 33 54.18	+56 16 51.7	+0.80	− 1.6	»
6.56186	24.8	272	−0.28	+2.5	3 33 54.31	+56 16 51.5	+0.87	− 1.8	»
12.53260	24.12	281	−0.24	+2.8	3 56 21.01	+56 5 58.4	+0.63	+ 0.6	»
12.53260	24.12	280	−0.24	+2.8	3 56 20.93	+56 5 57.1	+0.59	− 0.7	»
18.44916	24.8	287	−0.11	+3.3	4 16 34.16	+55 47 40.9	+0.74	− 9.7	»
18.44916	24.8	285	−0.11	+3.3	4 16 34.23	+55 47 40.3	+0.78	−10.3	»
24.48307	20.8	291	−0.17	+3.0	4 35 14.63	+55 24 22.9	+0.80	− 2.9	»
24.48307	20.8	292	−0.17	+3.0	4 35 14.51	+55 24 20.3	+0.73	− 5.5	»
25.51958	24.12	293	−0.22	+2.7	4 38 15.97	+55 19 59.5	+0.83	− 3.9	»
28.49030	24.8	296	−0.18	+2.9	4 46 38.67	+55 7 1.6	+1.03	+ 1.1	»
28.49030	24.8	295	−0.18	+2.9	4 46 38.48	+55 7 2.9	+0.92	+ 2.4	»

April 7. Splendidissimo, chiaro di luna piena. — April 8. Malgrado il chiarore di luna piena la cometa si vede bene. — May 9. Sereno splendido. — May 10. Splendido. — May 25. Cielo variabile, osservazioni contrastate. — Mai 31. Sereno ragnato. Chiaro di luna in primo quarto. — June 2. Osservazioni contrastate da nubi subitanee, dal plenilunio, e dall' aurora, per ciò la cometa fu vista debolissima. — June 6. Appena, appena visibile quasi inosservabile e ciò per la notevole diminuzione di splendore. — Juni 12. Cometa debolissima, appena osservabile. — June 18, 24. Debolissima, quasi inosservabile. — June 25. Debolissima; il cielo era splendidissimo. — June 28. A luna tramontata la cometa si distingue appena, appena sul fondo perfettamente sereno del cielo.

Bamberg. E. Hartwig.

Heliometer. A. N. 3485, 3486. Prob. error 1″.0, 1″.8; Comp. wt. 3.2, 1.0; Ass. wt. 2, 1.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
Mar. 21.66657	4	6	−0ˢ.23	+3″.6	21ʰ24ᵐ35ˢ.57	+18° 25′ 46″.9	−0ˢ.28	+1″.5	H
22.65025	4	2	−0.24	+3.6	21 28 14.64	+19 27 4.3	−0.48	−2.6	»
22.66308	4	11	−0.24	+3.6	21 28 17.75	+19 28 0.8	−0.26	+5.9	»
26.64805	2	23	−0.25	+3.5	21 43 35.52	+23 34 37.5	+0.06	−3.6	»
27.61058	2	23	−0.26	+3.8	21 47 24.07	+24 33 32.6	−0.19	−2.8	»
27.61058	1	31	−0.26	+3.8	21 47 24.05	+24 33 34.6	−0.23	−1.2	»
28.62059	2	39	−0.26	+3.6	21 51 27.21	+25 34 57.8	−0.26	−1.3	»
28.62081	2	31	−0.26	+3.6	21 51 27.36	+25 34 55.9	−0.18	−4.0	»

March 21. Bei schlechter Luft Kern nicht scharf. — March 26. Beobachtungen durch Nebellücken. — March 28. Luft so gut, dass Stern und Cometenkern sich wie zwei Sterne messen lassen.

Berkeley. A. O. Leuschner and R. T. Crawford.

6 in. equatorial. A. J. 444. Ass. wt. 1, 1.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
Mar. 23.03134	10.10	11	−0ˢ.29	+2″.6	21ʰ 29ᵐ 41ˢ.30	+19° 50′ 53″.5	+0ˢ.43	+2″.1	L
30.01985	10.10	40	−0.32	+2.4	21 57 9.46	+26 59 13.4	−0.33	−1.1	L
April 12.99720	14.10	112	−0.36	+2.1	23 0 3.49	+39 39 1.6	0.00	−2.0	L
22.99448	10.10	148	−0.38	+1.9	23 51 8.96	+46 33 18.8	−0.26	−4.5	C

Besançon. P. Chofardet.

Equatorial coudé. A. N. 3509. Prob. error 2″.0, 1″.5; Comp. wt. 0.9, 1.4; Ass. wt. 1, 1.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
April 7.58397	15.20	86	−0ˢ.30	+3″.7	22ʰ 34ᵐ 24ˢ.97	+35° 6′ 1″.3	−0ˢ.20	−1″.5	C
7.63192	12.16	86	−0.30	+3.1	22 34 34.83	+35 8 33.8	0.00	−2.0	»
8.57684	15.20	93	−0.29	+3.8	22 39 0.38	+35 58 26.0	+0.14	+0.8	»
8.62140	12.16	93	−0.30	+3.2	22 39 12.62	+36 0 44.8	−0.08	0.0	»
13.61354	18.12	116	−0.31	+3.1	23 3 4.76	+40 8 1.9	+0.16	−4.1	»
13.64669	12.9	116	−0.31	+2.6	23 3 14.57	+40 9 34.7	+0.19	−4.3	»
18.60647	12.12	129	−0.32	+3.0	23 28 12.01	+43 46 38.6	−0.06	−3.5	»
23.60032	12.16	148	−0.33	+3.0	23 54 23.10	+46 54 27.4	+0.31	−2.6	»
23.63431	3.4	148	−0.33	+2.4	23 54 33.21	+46 55 36.1	−0.21	−4.2	»
24.58600	12.13	156	−0.32	+3.1	23 59 38.59	+47 27 53.2	+0.05	+1.6	»
24.62900	9.8	156	−0.33	+2.5	23 59 52.38	+47 29 18.4	+0.03	+1.1	»
25.59039	9.12	162	−0.32	+3.1	0 5 2.47	+48 0 33.9	+0.31	−2.1	»
30.60715	9.12	177	−0.33	+2.7	0 32 15.50	+50 25 28.2	+0.09	−0.8	»
May 13.53729	12.14	225	−0.26	+3.4	1 42 10.92	+54 28 17.5	−0.13	−0.8	»
21.55539	12.15	245	−0.27	+3.0	2 23 2.78	+55 42 13.1	[+2.17]	+2.2	»
23.52959	9.6	250	−0.23	+3.3	2 32 34.37	+55 53 22.4	−0.02	−3.4	»
27.55588	12.16	258	−0.26	+2.9	2 51 24.05	+56 9 24.3	+0.49	+2.8	»
June 7.52418	12.12	273	−0.20	+3.1	3 37 39.13	+56 15 44.6	+0.34	−0.5	»
11.54919	12.12	277	−0.23	+2.8	3 52 46.00	+56 8 19.4	−0.38	−1.4	»

April 23 and 25. Le ciel se couvre.

Bordeaux. L. Picart.

C. R. 126.944; A. N. 3625. Great Equatorial 370 mm.

Prob. error 1″.5, 1″.1; Comp. wt. 1.4, 3; Ass. wt. 1, 2.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
Mar. 22.63640	not given by observer	11	−0ˢ.28	+3″.7	21ʰ 28ᵐ 11ˢ.95	+19° 26′ 15″.0	−0ˢ.09	−0″.1	P
April 5.65105		88	−0.31	+3.0	22 30 9.88	+34 15 56.2	+0.04	−1.7	»
7.64790		86	−0.31	+3.0	22 34 42.69	+35 9 23.3	−0.11	−3.6	»
12.63677		108	−0.33	+2.9	22 58 17.99	+39 21 49.1	−0.12	−3.4	»
19.62702		133	−0.34	+2.8	23 31 28.36	+44 27 32.9	−0.08	−4.7	»
23.63565		154	−0.34	+2.6	23 54 34.14	+46 55 36.1	+0.14	−7.0	»
29.63061		169	−0.35	+2.5	0 25 55.56	+49 59 39.9	−0.14	−0.7	»
May 2.60861		191	−0.34	+2.8	0 43 11.81	+51 14 47.3	+0.25	−4.2	»
June 17.46524		284	−0.08	+3.4	4 13 19.19	+55 51 12.1	−0.02	−2.7	»

College Park, Calif. H. D. Curtis.

6 in. Equatorial; filar micrometer. Ass. wt. 1, 1/2.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
April 18.00052	8.18	128	−0^{s}37	+1.″9	23^{h}25^m 5^s.82	+43° 21′ 45.″9	+0^s.25	− 1.″7	C
21.99435	6.20	144	−0.38	+1.9	23 45 51.84	+45 57 36.6	+0.06	+ 5.1	»
22.98389	24.12	148	−0.39	+2.1	23 51 6.46	+46 33 3.7	+0.33	+ 3.0	»
25.94635	12	163	—	+2.7	—	+48 12 5.4	—	+11.4	»
25.96397	10	163	−0.38	—	0 7 2.59	—	−0.09	—	»
25.97452	22	163	—	+2.4	—	+48 12 47.3	—	+ 2.6	»
29.96479	12.20	177	−0.40	+2.0	0 28 45.51	+50 8 25.6	+0.27	+ 3.6	»

Copenhagen. C. F. Pechüle.

360 mm Equatorial. A. N. 3485 and by letter. Prob. error 1.″4, 0.″9; Comp. wt. 1.8, 4; Ass. wt. 1, 2.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
Mar. 21.61790	30.6	5	−0^{s}22	+4.″2	21^{h}24^{m}24^s.65	+18° 22′ 44.″7	−0^s.40	+0.″4	P
22.65566	9.4	11	−0.21	+3.9	21 28 16.06	+19 27 28.7	−0.28	+1.5	»
April 1.58314	18.4	57	−0.24	+4.1	22 7 52.96	+29 30 39.8	−0.36	−1.3	»
2.56532	18.5	55	−0.24	+4.3	22 12 5.16	+30 27 29.6	−0.47	−4.3	»
3.61062	3	54	−0.24	—	22 16 37.22	—	−0.45	—	»
3.61732	1.1	54	−0.24	+3.7	22 16 39.25	+31 27 40.0	−0.21	−1.3	»
5.55981	12.4	81	−0.24	+4.2	22 25 14.43	+33 16 20.3	−0.32	−1.3	»
6.63906	6.5	80	−0.24	+3.3	22 30 6.31	+34 15 17.5	−0.22	−1.4	»
7.54234	3	84	—	+4.2	—	+35 3 48.1	—	−1.6	»
7.54814	5	84	−0.24	—	22 34 14.97	—	−0.32	—	»
7.58908	15.4	86	−0.25	+3.8	22 34 26.43	+35 6 15.5	−0.16	−3.6	»
13.61548	10.3	116	−0.26	+3.2	23 3 4.97	+40 8 9.9	−0.11	−1.9	»
14.60958	10.5	119	−0.26	+3.2	23 7 59.28	+40 54 2.5	−0.24	−3.4	»
21.51222	16.4	141	−0.22	+4.1	23 43 19.03	+45 39 45.0	−0.24	−2.4	»
25.57497	10.3	160	−0.27	+3.2	0 4 56.68	+48 0 4.0	−0.24	−2.4	»
26.45492	20.4	161	−0.15	+4.4	0 9 41.43	+48 27 44.3	−0.13	−2.1	»
27.48512	12.4	167	−0.20	+4.1	0 15 15.91	+48 58 56.1	−0.07	−0.4	»
28.44310	16.4	170	−0.13	+4.4	0 20 27.54	+49 26 43.5	−0.29	−1.7	»
May 4.47394	18.4	196	−0.17	+4.0	0 53 22.76	+51 56 43.9	−0.09	−0.1	»
4.50238	4.4	196	−0.21	+3.8	0 53 32.24	+51 57 18.8	+0.01	−1.7	»
7.45002	16.4	204	−0.13	+4.1	1 9 34.73	+52 55 38.0	−0.29	0.0	»
11.41223	16.4	220	−0.06	+4.1	1 30 54.68	+53 59 54.1	−0.21	−2.2	»
13.45461	16.4	222	−0.13	+3.9	1 41 44.20	+54 27 17.3	−0.22	+0.7	»
13.48770	4.4	222	−0.18	+3.6	1 41 54.83	+54 27 42.4	−0.12	+1.0	»
15.46655	24.4	228	−0.14	+3.7	1 52 15.57	+54 50 37.1	−0.10	−1.8	»
19.42158	4.4	237	−0.06	+3.8	2 12 26.12	+55 27 11.8	−0.16	+1.4	»

Greenwich. Bryant, Crommelin, Witchell and Showell.

6.7 in. Equatorial. M. N. 58.7. Cross-bar micrometer. Ass. wt. 1, 1.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
April 15.60301	4	125	−0^{s}28	+3.″6	23^{h}12^{m}56^s.27	+41° 38′ 43.″3	−0^s.38	− 5.″2	B
22.56131	6	145	−0.25	+3.9	23 48 50.80	+46 17 56.6	−0.52	− 4.1	W
22.57515	6	146	−0.27	+3.6	23 48 57.30	+46 18 29.7	+0.93	− 0.7	S
23.59167	3	151	−0.29	+3.4	23 54 20.44	+46 54 7.7	+0.38	− 4.4	B
23.59508	3	150	−0.29	+3.4	23 54 12.67	+47 6 14.2	[+8.30]	[+710.0]	B
30.57611	8	179	−0.28	+3.4	0 32 5.35	+50 24 34.2	+0.10	− 6.6	S
30.57611	8	178	−0.28	+3.4	0 32 5.24	+50 24 38.3	−0.04	− 2.5	S
May 18.49356	3	235	−0.14	+3.8	2 7 46.34	+55 19 34.2	+0.07	− 5.3	C

May 18. Wrong star given by observer.

Hamburg. R. Schorr and H. Ludendorff.

0.25 m equatorial, filar micrometer. A. N. 3560.

Ludendorff: Prob. error 1".4, 2".0; Comp. wt. 1.8, 0.8; Ass. wt. 1, 1.
Schorr: » » 1.5, 1.2; » » 1.4, 2.2; » » 1, 2.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C Δα cos δ	O—C Δδ	Obs.
Mar. 21.58588	30.5	4	−0ˢ.23	+4".4	21ʰ 24ᵐ 17ˢ.59	+18° 20′ 43".1	−0ˢ.40	−0".3	S
21.59851	30.5	4	−0.23	+4.3	21 24 20.19	+18 21 28.7	−0.59	−2.0	L
31.53252	23.4	44	−0.22	+4.6	22 3 27.11	+28 29 2.6	+0.10	−4.1	S
31.53252	23.4	46	−0.22	+4.6	22 3 27.08	+28 29 2.8	+0.07	−3.9	S
31.61750	16.3	46	−0.25	+3.8	22 3 48.14	+28 34 3.0	−0.24	−4.0	L
31.61750	16.3	44	−0.25	+3.8	22 3 48.19	+28 34 1.6	−0.19	−5.4	L
April 1.57367	24.4	49	−0.25	+4.2	22 7 50.83	+29 30 5.1	−0.12	−2.9	S
1.61642	24.4	49	−0.25	+3.8	22 8 1.53	+29 32 34.7	−0.30	−2.7	L
2.55628	30.5	55	−0.24	+4.3	22 12 3.28	+30 26 53.1	−0.07	−9.6	L
3.63051	30.5	62	−0.25	+3.5	22 16 42.67	+31 28 23.2	−0.25	−2.9	L
14.52255	30.5	118	−0.23	+4.3	23 7 33.68	+40 50 8.3	−0.01	+0.7	L
25.55382	32.6	160	−0.27	+3.5	0 4 50.22	+47 59 21.9	+0.01	−3.9	L
26.47100	24.4	164	−0.17	+4.4	0 9 46.98	+48 28 15.8	+0.11	−0.3	S
27.48658	23.4	167	−0.19	+4.2	0 15 16.24	+48 58 58.1	−0.16	−1.0	L
May 7.48590	24.4	204	−0.18	+3.9	1 9 47.06	+52 56 15.2	+0.10	−1.9	S
11.40547	24.4	219	−0.04	+4.2	1 30 53.19	+53 59 46.7	+0.19	−3.9	S
11.40547	24.4	220	−0.04	+4.2	1 30 53.32	+53 59 44.3	+0.26	−6.3	S
21.41207	23.4	247	−0.03	+3.9	2 22 18.53	+55 41 14.6	+0.04	−1.5	S

March 31. Verwaschener Kern 7ᵐ.5. Wolken stören. — April 1. Luft gut. — April 14. Kern 8ᵐ.5. Luft gut. — April 25. Wolken. — April 27. Wolken. — May 21. Luft schlecht. Comet 11ᵐ.0, verschwindet öfters. — May 28. Im dunklen Feld noch zu erkennen, aber für eine Messung zu schwach.

Heidelberg. M. Wolf and A. Schwassmann.

87 mm refractor; ring micrometer. A. N. 3488. Ass. wt. 0, 0.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C Δα cos δ	O—C Δδ	Obs.
Mar. 28.64325	7	29	−0ˢ.26	+3".5	21ʰ 51ᵐ 33ˢ.92	+25° 36′ 30".4	+0ˢ.65	+9".1	W, S

Kern gut begrenzt und etwa 7ᵐ.5.

Jena. O. Knopf.

174 mm equatorial; ring micrometer. Communicated by letter. A. N. 3533. Ass. wt. 1, 1.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C Δα cos δ	O—C Δδ	Obs.
April 5.63715	10	81	−0ˢ.27	+3".1	22ʰ 25ᵐ 35ˢ.18	+33° 20′ 35".1	−0ˢ.34	−2".0	K
6.57229	3	80	−0.27	+3.8	22 29 48.29	+34 11 36.1	−0.02	−5.0	»
8.58940	12	93	−0.28	+3.6	22 39 3.40	+35 59 4.0	−0.25	−0.5	»
30.56495	7	177	−0.30	+3.1	0 32 2.28	+50 24 18.3	+0.47	−5.2	»
May 13.54980	14	226	−0.27	+3.0	1 22 14.59	+54 28 29.2	−0.03	+1.5	»
29.51315	17	261	−0.20	+3.1	3 0 11.47	+56 14 6.7	+0.31	+1.9	»

April 5. Comet bis lange in die Dämmerung sichtbar, ebenso vorher während des hellen Mondscheins. — April 6. Nur drei Durchgänge wegen eintretender Bewölkung. — April 8. Himmel nicht ganz rein, ausserdem sehr heller Mondschein. — April 30. Durch trüben Himmel Beobachtung beeinträchtigt.

Kasan. V. Baranof.

A. N. 3726. Merz-Equ. of $0^m.244$ aperture. Prob. error 2″.5, 3″.2; Comp. wt. 0.5, 0.3; Ass. wt. 1/2, 1/2.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
Mar. 27.46226	8.8	341	$-0^s.22$	+4″.5	$21^h 46^m 48^s.43$	+24° 24′ 28″.1	$-0^s.36$	− 4″.1	B
28.47060	11.4	29	−0.23	+4.4	21 50 51.28	+25 25 49.6	+0.09	− 4.3	»
April 2.47297	24.8	55	−0.24	+4.2	22 11 41.58	+30 22 10.6	−0.22	− 4.2	»
3.44134	9.4	342	−0.23	+4.4	22 15 53.75	+31 17 39.1	+0.26	− 2.3	»
12.36177	5.2	343	−0.16	+4.9	22 56 57.91	+39 8 30.4	−0.11	− 9.4	»
12.46152	9.3	343	−0.25	+3.9	22 57 23.61	+39 13 7.5	[−3.48]	[−20.4]	»
14.36272	18.10	118	−0.17	+4.8	23 6 46.45	+40 42 53.5	+0.20	+ 5.1	»
15.39230	8.8	345	−0.20	+4.5	23 11 53.74	+41 29 25.3	+0.18	− 0.1	»
18.37421	18.8	346	−0.18	+4.6	23 27 0.25	+43 37 10.8	−0.14	− 1.7	»
21.41007	13.5	141	−0.22	+4.1	23 42 46.67	+45 35 44.1	−0.34	−15.4	»
23.39295	24.8	347	−0.20	+4.2	23 53 16.27	+46 47 18.2	−0.09	− 1.5	»
24.35746	30.10	153	−0.16	+4.5	23 58 25.03	+47 20 7.8	−0.07	− 6.2	»
25.32152	18.12	349	−0.08	+4.7	0 3 34.95	+47 51 55.7	−0.21	− 1.8	»
26.43180	11.4	350	−0.24	+3.7	0 9 30.77	+48 26 24.6	[−3.35]	[−38.8]	»
27.39650	12.4	167	−0.21	+4.0	0 14 46.46	+48 56 14.5	−0.49	− 4.1	»
May 3.34486	24.8	351	−0.13	+4.2	0 47 13.03	+51 31 47.2	+0.12	− 4.1	»
5.33218	16.8	352	−0.11	+4.3	0 58 3.54	+52 14 41.2	−0.21	− 0.6	»
7.37374	24.8	204	−0.16	+3.9	1 9 9.80	+52 54 5.3	−0.35	− 9.1	»
8.29867	29.10	353	−0.04	+4.2	1 14 10.84	+53 10 41.3	−0.14	− 1.8	»
12.32573	20.7	221	−0.08	+4.0	1 35 45.83	+54 12 24.0	−0.43	−13.8	»
13.33149	39.8	222	−0.09	+4.0	1 41 5.51	+54 25 44.7	−0.23	+ 0.6	»
14.33819	19.4	227	−0.10	+3.9	1 46 22.99	+54 37 49.8	+0.05	− 7.8	»
15.41157	12.3	229	−0.20	+3.4	1 51 58.33	+54 49 53.3	−0.16	− 9.9	»
16.33866	34.7	233	−0.10	+3.8	1 56 45.92	+54 59 36.7	−0.22	− 7.7	»
17.32211	18.12	354	−0.07	+3.9	2 1 48.37	+55 9 11.9	−0.39	− 4.3	»
18.31097	30.12	236	−0.05	+3.9	2 6 51.09	+55 18 5.9	+0.17	− 0.5	»
21.37941	20.12	247	−0.15	+3.5	2 22 8.41	+55 41 3.1	−0.24	− 0.4	»

April 3. Vent fort. — April 12. Nuages. — April 27. L'air est vaporeux. — May 3. La comète est faible. — May 14. Vaporeux. L'observation s'interrompait plusieurs fois. La comète est difficile à voir.

Kiel. F. Ristenpart.

8 in. refractor; see note. A. N. 3538. Prob. error 2″.7, 2″.9; Comp. wt. 0.5, 0.4; Ass. wt. 1/2, 1/2.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
April 1.59400	4	49	$-0^s.25$	—	$22^h 7^m 56^s.03$	—	$-0^s.09$	—	R
1.59400	4	57	−0.25	—	22 7 55.98	—	−0.13	—	»
1.59400	4	58	−0.24	—	22 7 55.86	—	−0.24	—	»
5.62210	6	74	−0.25	+3″.5	22 25 31.60	+33° 19′ 45″.3	+0.05	− 2″.1	»
5.62210	6	78	−0.25	+3.5	22 25 31.82	+33 19 44.2	+0.23	− 3.2	»
5.62210	6	79	−0.25	+3.5	22 25 31.81	+33 19 45.9	+0.23	− 1.5	»
14.52233	3	120	−0.23	+4.3	23 7 33.81	+40 50 0.0	+0.14	− 7.0	»
14.52364	2	118	−0.23	+4.3	23 7 33.81	+40 50 5.6	−0.16	− 4.9	»
14.52442	4	119	−0.23	+4.3	23 7 34.28	+40 50 10.0	+0.02	− 2.8	»
21.35601	33	142	+0.02	—	23 42 29.77	—	−0.24	—	»
21.35968	18	141	+0.01	—	23 42 31.21	—	−0.04	—	»
21.36642	3	141	—	+5.0	—	+45 34 16.9	—	− 5.2	»
21.37264	1	142	—	+5.0	—	+45 46 23.8	—	−12.2	»
25.58333	30.6	160	−0.28	+3.2	0 4 59.88	+48 0 9.9	+0.10	−12.5	»
May 7.40078	6	204	−0.04	+4.3	1 9 19.75	+52 54 39.6	+0.34	− 4.5	»
26.42640	1	255	−0.05	+3.7	2 46 13.85	+56 5 52.1	+0.87	+ 6.4	»
27.49190	1	255	−0.16	+3.4	2 51 4.82	+56 9 3.6	−0.48	− 6.8	»
27.49190	1	256	−0.16	+3.4	2 51 5.09	+56 9 5.0	−0.33	− 5.4	»

April 1 Fadenmikrometer, helles Feld, April 21, 25 helle Fäden, sonst Kreuzstabmikrometer. — May 26. Nur ein Durchgang durch Wolken. — May 27. Nach einem guten Durchgang trübe.

Königsberg. H. Struve and F. Cohn.

325 mm refractor. A. N. 3588.

Cohn: Prob. error 1″.4, 1″.2; Comp. wt. 1.8, 2.2; Ass. wt. 1, 2.
Struve: » » 0.9, 0.5; » » 4, 13; » » 2, 3.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha\cos\delta$	O—C $\Delta\delta$	Obs.
April 7.51894	8.12	91	−0ˢ.24	+4″.3	22ʰ 34ᵐ 7ˢ.16	+35° 2′ 32″.8	−0ˢ.14	−2″.1	C
10.43755	1	101	−0.16	—	22 47 44.47	—	+0.14	—	S
13.45993	7.8	116	−0.19	+4.7	23 2 19.09	+40 0 53.6	−0.18	−0.7	S
20.42745	3.4	135	−0.15	+4.7	23 37 38.18	+44 58 45.1	−0.20	−3.5	S
24.38414	5.6	152	−0.08	+4.8	23 58 33.54	+47 21 4.7	−0.18	−3.0	S
29.36709	8.8	172	−0.04	+4.6	0 25 29.63	+49 52 30.2	0.00	−1.0	S
May 3.40500	6.6	192	−0.10	+4.3	0 47 32.33	+51 33 10.9	−0.14	−2.2	S
6.36516	10	202	−0.02	—	1 3 41.62	—	+0.06	—	C
6.41182	8	203	—	+4.2	—	+52 36 8.3	—	−1.5	C
7.43256	4.4	207	−0.14	+4.1	1 9 29.58	+52 55 18.3	+0.04	−0.6	S
14.40264	8.16	227	−0.08	+4.0	1 46 43.27	+54 38 40.4	+0.08	−2.5	C
15.43603	8.8	229	−0.13	+3.8	1 52 6.99	+54 50 17.8	+0.44	−1.4	C
20.40134	12.8	242	−0.07	+3.8	2 17 19.45	+55 34 24.9	+0.06	−1.9	C
26.43133	7.8	255	−0.11	+3.6	2 46 13.75	+56 5 45.9	+0.04	−0.9	C
27.41859	7.8	257	−0.09	+3.6	2 50 45.82	+56 8 58.7	+0.11	+1.2	C
29.39831	12.12	260	−0.05	+3.6	2 59 40.71	+56 13 49.5	+0.21	−1.7	C
June 9.43259	6.8	276	−0.10	+3.3	3 44 56.26	+56 12 40.4	−0.03	−4.3	C
11.42722	4	278	−0.09	—	3 52 20.78	—	+0.43	—	C
11.43809	2	278	—	+3.3	—	+56 8 30.3	—	−6.0	C

April 10. Nur ein Satz in α durch Gewölk. — April 13. Befriedigend. — April 20. Leidlich. — April 24. Befriedigend, deutlicher Kern. — April 29. Ganz gut. — May 3. Mondschein, Comet ganz gut einzustellen. — May 7. Durch Nebel und Gewölk, Comet schwach. — May 14. Leidlich. — May 20. Comet schon ziemlich schwach. — May 26. Comet recht schwach, zum Schluss bewölkt. — May 27. Comet leidlich gut sichtbar, Beobachtung wiederholt durch Wolken gestört. — May 29. Comet sehr schwach, Beobachtung leidlich. — June 9. Comet äusserst schwach, Beobachtung nur mässig. — June 11. Comet äusserst schwer zu finden; Beobachtung ganz unsicher, besonders in δ, wo sie durch Wolken unterbrochen wurde. — June 15. Comet zuweilen noch geahnt, aber nicht mehr zu beobachten.

Kremsmünster. F. Schwab.

Ring micrometer. A. N. 3485 and 3529. Prob. error 2″.0, 1″.2; Comp. wt. 0.9, 2.2; Ass. wt. 1, 2.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha\cos\delta$	O—C $\Delta\delta$	Obs.
Mar. 21.64027	6	3	−0ˢ.25	+3″.6	21ʰ 24ᵐ 30ˢ.28	+18° 24′ 4″.7	+0ˢ.23	−2″.4	S
25.63997	6	17	−0.26	+3.4	21 39 39.55	+22 32 32.7	+0.64	−6.2	»
27.62536	10	28	−0.27	+3.5	21 47 28.47	+24 34 27.7	+0.60	−1.8	»
28.60338	6	36	−0.27	+3.6	21 51 23.43	+25 33 55.8	+0.09	−0.9	»
28.62528	8	32	−0.26	+3.2	21 51 28.78	+25 35 13.4	+0.13	−2.9	»
31.61011	9	48	−0.28	+3.4	22 3 46.75	+28 33 39.8	+0.18	−1.2	»
April 5.63162	6	75	−0.29	+2.9	22 25 34.44	+33 20 19.6	+0.28	+0.7	»
6.60262	5	82	−0.29	+3.3	22 29 56.68	+34 13 19.1	+0.02	−1.4	»
7.60178	8	86	−0.30	+3.2	22 34 30.36	+35 6 51.7	+0.19	−7.9	»
8.60565	6	102	−0.30	+3.1	22 39 8.16	+35 59 52.6	−0.06	−2.8	»
11.58263	2	110	−0.30	+3.3	22 53 12.67	+38 30 43.8	+0.21	−2.4	»
12.62022	6	111	−0.30	+2.8	22 58 13.61	+39 21 2.5	+0.22	−2.4	»
14.60212	10	119	−0.31	+2.9	23 7 57.47	+40 53 42.5	+0.08	−3.0	»
19.60430	5	137	−0.32	+2.7	23 33 21.35	+44 26 39.4	−0.04	−4.3	»
30.59381	6	184	−0.33	+2.6	0 32 11.50	+50 25 5.3	+0.32	−3.0	»

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
May 2.58654	5	190	−0ˢ.33	+2″.6	0ʰ43ᵐ 4ˢ.39	+51° 14′ 16″.1	+0ˢ.14	−4″.2	S
14.54504	8	223	−0.29	+3.0	1 47 28.17	+54 40 18.6	+0.21	−3.4	»
20.54867	4	246	−0.28	+2.9	2 18 3.82	+55 35 27.5	+0.38	−1.7	»

Time of second observation of March 28th given as corrected by observer.

Leipzig. F. Hayn.

300 mm refractor; filar micrometer. A. N. 3547. Ass. wt. 1, 2.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
Mar. 28.63789	15.5	29	−0ˢ.25	+3″.5	21ʰ51ᵐ31ˢ.60	+25° 36′ 0″.6	−0ˢ.08	−1″.4	H
28.63789	15.5	32	−0.25	+3.5	21 51 31.41	+25 36 0.2	−0.25	−1.8	»
28.65893	15.5	29	−0.24	+3.4	21 51 36.57	+25 37 16.8	−0.21	−1.6	»
28.65893	15.5	32	−0.24	+3.4	21 51 36.44	+25 37 16.4	−0.32	−2.0	»

Liverpool. W. Plummer.

6.7 in. equatorial; filar and cross-bar micrometer. M. N. 59.101. Prob. error 2″.0, 1″.8; Comp. wt. 0.9, 1.0; Ass. wt. 1, 1.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
Mar. 21.66045	25.5	3	−0ˢ.23	+4″.1	21ʰ24ᵐ34ˢ.74	+18° 25′ 27″.5	+0ˢ.17	+ 4″.6	P
21.66045	25.5	5	−0.23	+4.0	21 24 34.85	+18 25 31.1	+0.28	+ 8.2	»
22.66404	25.5	11	−0.23	+4.0	21 28 17.99	+19 27 56.2	−0.23	− 2.3	»
23.67181	12.3	10	−0.18	+4.0	21 32 5.67	+20 30 32.7	−0.12	− 9.4	»
27.65507	25.5	26	−0.24	+3.9	21 47 34.90	+24 36 17.9	−0.01	0.0	»
27.65507	25.5	28	−0.24	+3.9	21 47 34.80	+24 36 18.1	−0.08	+ 0.2	»
28.63819	ret.	36	−0.25	+4.0	21 51 31.58	+25 36 2.8	−0.17	− 0.3	»
31.62412	30.6	46	−0.25	+4.1	22 3 50.19	+28 34 29.8	+0.11	− 0.7	»
31.62412	30.6	44	−0.25	+4.1	22 3 50.18	+28 34 29.0	+0.10	− 1.5	»
April 1.63503	ret.	49	−0.25	+4.1	22 8 3.16	+29 32 54.4	[−3.47]	[−48.0]	»
3.64364	25.5	62	−0.26	+3.8	22 16 46.19	+31 29 8.1	−0.18	− 2.7	»
6.61122	30.6	82	−0.26	+3.8	22 29 59.14	+34 13 47.7	+0.12	− 0.7	»
8.61501	25.5	102	−0.26	+3.8	22 39 10.90	+36 0 24.7	+0.04	− 0.1	»
8.61501	25.5	90	−0.26	+3.8	22 39 10.86	+36 0 25.4	+0.01	+ 0.6	»
12.63650	ret.	111	−0.27	+3.4	22 58 18.63	+39 21 45.9	+0.43	− 5.8	»
14.55480	25.5	118	−0.26	+3.8	23 7 43.25	+40 51 34.6	−0.04	− 1.3	»
14.55480	25.5	119	−0.23	+4.3	23 7 43.10	+40 51 34.9	−0.15	− 1.0	»
25.52457	ret.	160	−0.20	+4.3	0 4 41.22	+47 58 26.1	+0.30	− 3.4	»
30.56608	ret.	184	−0.25	+3.6	0 32 2.31	+50 24 23.5	+0.26	− 1.7	»
May 2.56509	ret.	190	−0.24	+3.6	0 42 57.22	+51 13 47.4	+0.06	− 2.7	»

The observations made with the crossed bars are marked »ret.«.

March 23. Haze and fog; comet seen with difficulty and observation of little value. — April 1. The observation was unsatisfactory; comet seemed so ill-defined. — April 6. Notwithstanding the strong moonlight the comet was easily seen, and the observation thought good. — April 14. Apparently no condensation; the center of the nebulosity observed. — April 25. Images very bad; clouds rising rendered later observation impossible.

Marseilles. E. Esmiol.

0ᵐ.26 equatorial; B. A. 15.423. Prob. error 2″.7, 2″.3; Comp. wt. 0.5, 0.6; Ass. wt. ½, 1.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
Mar. 23.68756	7.7	13	−0ˢ.26	+3″.0	21ʰ32ᵐ 9ˢ.33	+20° 31′ 34″.7	−0ˢ.05	−6″.4	E
24.66508	7.7	16	−0.28	+3.9	21 35 54.05	+21 32 22.3	−0.99	−1.3	»
24.68514	5.5	14	−0.27	+2.9	21 35 57.26	+21 33 35.7	−0.33	−0.6	»
25.66747	5.5	19	−0.27	+3.0	21 39 44.82	+22 34 22.0	−0.54	−0.5	»

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
Mar. 25.67532	5.5	21	−0ˢ.28	+3″.0	21ʰ 39ᵐ 47ˢ.24	+22° 34′ 55″.4	+0ˢ.12	+ 5″.7	E
27.66496	6.6	28	−0.29	+3.0	21 47 36.99	+24 36 55.9	−0.26	+ 1.5	»
27.67952	5.5	33	−0.28	+2.8	21 47 40.60	+24 37 47.7	−0.16	+ 0.1	»
April 4.65718	5.5	66	−0.31	+2.7	22 21 13.15	+32 26 16.5	−0.54	+ 1.0	»
4.67063	6.6	71	−0.30	+2.5	22 21 17.17	+32 27 30.4	−0.17	[+29.9]	»
7.66466	6.6	86	−0.31	+2.4	22 34 47.18	+35 10 16.4	−0.22	− 4.0	»
13.62430	6.6	116	−0.34	+2.8	23 3 7.45	+40 8 35.5	−0.21	− 0.7	»

April 7. Declination corrected by observer.

Mt. Hamilton. W. J. Hussey.

12 in. equatorial; filar micrometer. A. J. 461.

Prob. error 1″.2, 1″.4; Comp. wt. 2.2, 1.7; Ass. wt. 2, 1.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
Mar. 22.04410	15.9	9	−0ˢ.28	+2″.6	21ʰ 25ᵐ 59ˢ.42	+18° 49′ 19″.7	−0ˢ.26	+0″.7	H
23.01575	10.8	8	−0.30	+2.8	21 29 37.23	+19 49 54.1	−0.08	+1.0	»
27.03215	12.8	23	−0.30	+2.4	21 45 6.12	+23 58 5.3	−0.44	−8.8	»
27.99572	d8.8	30	−0.32	+2.8	21 48 56 58	+24 57 0.4	−0.07	−2.9	»
28.00976	d10.8	31	−0.32	+2.6	21 49 0.00	+24 57 47.5	−0.02	−7.0	»
29.02037	4	34	—	+2.4	—	+25 59 6.2	—	−3.3	»
29.04045	d10.10	35	−0.30	+2.2	21 53 9.43	+26 0 18.6	−0.12	−3.7	»
30.00742	9.8	41	−0.32	+2.5	21 57 6.53	+26 58 28.4	−0.21	−1.4	»
31.00219	12.8	45	−0.33	+2.6	22 1 13.84	+27 57 43.5	−0.07	−2.0	»
31.99315	8.8	50	−0.33	+2.6	22 5 23.38	+28 56 11.4	+0.04	−0.5	»
April 3.00771	10.8	59	−0.33	+2.4	22 14 0.16	+30 52 54.5	−0.20	−2.4	»
3.02668	10.8	61	−0.32	+2.1	22 14 5.28	+30 54 0.1	−0.03	−1.9	»
4.03102	6	65	—	+2.0	—	+31 51 4.0	—	−0.9	»
5.01900	d8.8	73	−0.33	+2.1	22 22 50.25	+32 46 26.4	+0.15	+0.7	»
6.98510	d8.8	87	−0.35	+2.5	22 31 40.82	+34 33 35.6	−0.11	−4.0	»
9.00873	d10.10	98	−0.35	+2.1	22 41 0.66	+36 20 50.6	−0.14	−2.9	»
16.01899	8.7	122	−0.36	+1.6	23 15 2.15	+41 57 10.2	+0.06	−0.4	»
16.98355	8.8	127	−0.38	+2.2	23 19 54.13	+42 38 54.3	−0.24	−3.5	»
18.94740	8.8	130	−0.37	+2.8	23 29 57.08	+44 0 28.0	−0.35	−3.1	»
21.01186	10.8	140	−0.38	+2.0	23 40 41.90	+45 21 2.3	+0.09	−2.0	»
22.02602	3	144	—	+1.3	—	+45 58 40.5	—	−0.4	»
22.98601	d10.10	149	−0.39	+2.0	23 51 6.60	+46 33 3.1	−0.03	−2.5	»
22.99583	4	147	—	+1.9	—	+46 33 20.5	—	−5.7	»
23.00586	d8.8	149	−0.38	+1.7	23 51 12.90	+46 33 46.3	+0.10	−0.9	»
26.99368	4.3	166	−0.39	+1.8	0 12 36.56	+48 44 10.9	+0.14	−3.2	»
28.93990	10.8	173	−0.38	+2.8	0 23 10.15	+49 40 43.3	+0.04	−0.9	»
May 2.96133	10.10	187	−0.39	+2.3	0 45 7.21	+51 23 2.7	+0.09	−2.0	»
3.95271	d8.8	193	−0.38	+2.5	0 50 32.15	+51 45 24.5	+0.02	−1.2	»
3.97371	d8.8	193	−0.39	+2.1	0 50 39.04	+51 45 52.5	+0.03	−0.9	»
4.95889	d10.10	198	−0.39	+2.4	0 56 1.90	+52 6 57.0	+0.11	−2.1	»
9.97907	d10.10	212	−0.39	+2.1	1 23 14.70	+53 38 26.6	−0.01	−0.5	»
9.98920	4	214	—	+3.3	—	+53 38 43.4	—	+6.8	»
10.94712	10.10	217	−0.38	+2.5	1 28 26.01	+53 53 9.7	−0.01	−1.1	»
17.95171	10.6	235	−0.37	+2.4	2 5 2.04	+55 14 55.5	+0.10	−3.3	»
19.98498	d8.8	240	−0.38	+1.8	2 15 15.17	+55 31 25.0	−0.02	−1.3	»
23.95861	d8.8	250	−0.36	+2.2	2 34 37.13	+55 55 33.5	−0.14	−0.1	»

d indicates direct micrometer measures.

Mt. Hamilton. C. D. Perrine.

12 and 36 in. equatorials. A. J. 459. Prob. error 1″.8, 1″.3; Comp. wt. 1.0, 1.9; Ass. wt. 1, 2.

1898 Gr. M. T.	No. Comp.	#	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O−C $\Delta\alpha\cos\delta$	O−C $\Delta\delta$	Obs.
Mar. 20.02831	d10.8	1	−0^s.29	+2″.9	21^{h}18^{m}36^s.60	+16° 43′ 26″.2	−0^s.10	−1″.7	P
22.01707	13.8	9	−0.30	+2.8	21 25 53.85	+18 47 37.9	+0.16	+0.7	»
22.97639	10.6	8	−0.31	+3.1	21 29 28.64	+19 47 27.6	+0.17	+1.6	»
27.00069	12.7	24	−0.32	+2.7	21 44 58.93	+23 56 15.1	−0.02	−3.4	»
27.96867	d10.8	30	−0.33	+3.1	21 48 50.02	+24 55 22.5	−0.11	−2.0	»
29.03218	d10.8	35	−0.31	+2.4	21 53 7.50	+25 59 48.3	−0.05	−4.0	»
30.02449	10.8	42	−0.31	+2.3	21 57 10.99	+26 59 27.9	+0.02	−3.3	»
31.02603	10.8	45	−0.31	+2.3	22 1 19.82	+27 59 8.5	−0.05	−1.7	»
April 2.97479	12.8	59	−0.34	+2.8	22 13 51.56	+30 51 0.4	−0.23	−4.3	»
3.98061	10.8	65	−0.34	+2.7	22 18 14.93	+31 48 12.2	+0.02	−2.8	»
4.98504	10.8	70	−0.34	+2.6	22 22 41.11	+32 44 31.3	+0.08	−1.0	»
6.99396	d11.8	87	−0.35	+2.4	22 31 43.11	+34 34 24.0	−0.21	−4.2	»
7.98476	10.8	94	−0.35	+2.5	22 36 15.94	+35 27 17.3	+0.08	−1.0	»
9.00848	d10.8	98	−0.35	+2.1	22 41 0.52	+36 20 52.5	−0.19	−0.2	»
11.00533	d10.8	104	−0.36	+2.1	22 50 26.24	+38 2 12.5	−0.17	−2.9	»
11.99477	d10.8	109	−0.36	+2.2	22 55 11.39	+38 50 54.0	−0.01	+1.5	»
13.00243	10.8	113	−0.36	+2.0	23 0 4.87	+39 39 15.9	−0.12	−2.6	»
13.96819	8.7	117	−0.37	+2.6	23 4 49.24	+40 24 34.6	−0.01	−2.1	»
15.97224	10.6	126	−0.37	+2.5	23 14 48.01	+41 55 3.2	+0.11	−4.1	»
17.00312	12.8	127	−0.37	+1.9	23 20 0.06	+42 39 45.4	−0.26	+3.8	»
17.97265	d10.8	128	−0.38	+2.4	23 24 56.87	+43 20 35.7	−0.06	−2.5	»
18.97724	16.8	131	−0.39	+2.3	23 30 6.66	+44 1 41.4	−0.06	−1.8	»
19.97961	2	138	—	+2.2	—	+44 41 22.8	—	−4.9	»
20.97927	14.8	139	−0.38	+2.2	23 40 31.74	+45 19 47.4	+0.15	−3.2	»
21.01576	10.6	140	−0.37	+1.6	23 40 43.05	+45 21 10.8	+0.04	−2.3	»
21.97080	16.8	144	−0.39	+2.3	23 45 44.26	+45 56 39.0	−0.03	−1.0	»
22.96609	d10.8	149	−0.38	+2.4	23 51 0.19	+46 32 21.0	−0.07	−2.4	»
23.96143	16.8	157	−0.38	+2.5	23 56 17.95	+47 6 48.9	−0.15	−3.0	»
24.95190	d10.8	159	−0.38	+2.6	0 1 35.89	+47 39 52.8	−0.20	−3.2	»
25.95421	d10.8	163	−0.38	+2.6	0 6 59.45	+48 12 6.6	−0.07	−2.3	»
26.95785	16.8	166	−0.38	+2.5	0 14 24.79	+48 43 6.1	+0.05	+3.3	»
28.97105	16.8	173	−0.39	+2.2	0 23 20.16	+49 41 35.4	−0.06	−0.7	»
28.97105	16.8	174	−0.32	+2.2	0 23 20.32	+49 41 33.6	+0.05	−2.5	»
29.94918	12.7	180	−0.38	+2.6	0 28 40.08	+50 8 12.0	+0.07	−1.3	»
May 1.99513	4	185	—	+1.7	—	+51 0 10.8	—	−2.3	»
1.99718	d2	185	−0.40	—	0 39 51.65	—	+0.47	—	»
2.99128	12.8	187	−0.40	+1.8	0 45 17.41	+51 23 44.7	+0.32	−1.6	»
3.99212	16.8	194	−0.40	+1.8	0 50 45.35	+51 46 17.2	+0.20	−0.4	»
4.98240	d10.8	197	−0.40	+2.0	0 56 9.42	+52 7 28.3	0.00	−0.2	»
5.93773	12.8	202	−0.37	+2.7	1 1 22.32	+52 26 53.2	+0.26	−0.1	»
6.97540	d10.8	205	−0.40	+2.1	1 7 0.19	+52 46 51.5	−0.25	−0.8	»
8.94114	18 9	210	−0.37	+2.6	1 17 39.68	+53 21 37.7	+0.18	−1.5	»
9.89674	d10.8	212	−0.40	+1.8	1 23 17.21	+53 38 32.9	+0.01	−1.3	«
9.99959	d8.7	214	−0.40	+1.6	1 23 21.50	+53 38 45.2	+0.11	−1.2	»
10.98024	12.8	217	−0.39	+1.9	1 28 37.04	+53 53 39.2	+0.23	−0.9	»
11.92133	d10.8	220	−0.35	+2.9	1 33 37.68	+54 7 6.0	−0.01	−0.4	»
11.94368	14.9	219	−0.37	+2.6	1 33 44.88	+54 7 23.8	+0.04	−1.2	»
13.98488	14.10	227	−0.39	+1.8	1 44 32.17	+54 33 42.8	+0.20	−3.4	»
16.92573	14.8	233	−0.34	+2.9	1 59 47.51	+55 5 28.4	+0.12	−2.3	»
19.92422	16.8	238	−0.34	+2.8	2 14 57.13	+55 30 58.1	+0.05	−5.7	»
19.94384	d10.8	239	−0.36	+2.5	2 15 2.84	+55 31 6.5	−0.04	−1.5	»
20.95046	d10.8	246	−0.36	+2.4	2 20 2.49	+55 38 12.4	+0.13	−1.9	»
20.96509	4	244	—	+2.1	—	+55 38 19.7	—	−0.3	»

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
May 20.97230	11	244	−0.37	—	2h 20m 8.52	—	−0.11	—	P
25.93826	5	253	—	+2.5	—	+56° 3′ 59.9	—	−1.3	»
25.94854	16	253	−0.34	—	2 43 59.70	—	+0.16	—	»
28.94658	3	259	—	+2.4	—	+56 12 50.3	—	−3.6	»
29.92153	d10.8	261	−0.31	+2.7	3 1 59.59	+56 14 47.7	+0.18	−2.6	»
29.93391	d10.8	260	−0.33	+2.5	3 2 2.58	+56 14 53.4	+0.02	+1.7	»
June 2.95481	d8.8	267	−0.34	+2.2	3 19 16.07	+56 18 33.2	−0.10	−1.6	»
3.94822	d10.8	268	−0.33	+2.2	3 23 22.95	+56 18 36.9	+0.29	+4.2	»
4.97216	8.4	271	−0.35	+1.9	3 27 32.67	+56 18 7.8	+0.17	−1.7	»
5.95643	14.8	271	−0.33	+2.1	3 31 29.00	+56 17 26.2	+0.02	−1.7	»
6.93987	18.8	272	−0.32	+2.3	3 35 22.11	+56 16 27.9	+0.16	+1.4	»
7.93498	d10.8	274	−0.31	+2.4	3 39 13.95	+56 15 12.2	+0.05	+1.0	»
8.92952	d10.8	275	−0.30	+2.4	3 43 2.70	+56 13 35.9	+0.29	−1.9	»
9.93855	d10.8	276	−0.31	+2.3	3 46 50.27	+56 11 47.5	+0.03	+0.1	»
10.95254	d10.8	277	−0.32	+2.1	3 50 35.36	+56 9 41.5	−0.19	−0.1	»
11.94489	d10.8	280	−0.31	+2.2	3 54 12.53	+56 7 24.6	−0.18	−0.2	»
11.96748	d10.8	279	−0.33	+1.9	3 54 17.73	+56 7 21.6	−0.02	+0.3	»
12.94952	10.6	282	−0.32	+2.1	3 57 49.53	+56 4 54.4	+0.17	+1.0	»
14.92771	d10.8	283	−0.29	+2.4	4 4 45.18	+55 59 20.2	+0.06	−0.6	»
17.92572	10.6	286	−0.29	+2.3	4 14 50.47	+55 49 39.5	+0.14	−0.7	»
19.94603	10.6	288	−0.30	+2.1	4 21 21.43	+55 42 23.2	+0.01	−1.8	»
20.90973	d10.8	288	−0.26	+2.5	4 24 23.48	+55 38 47.0	+0.02	+0.4	»
20.91933	d8.6	289	−0.28	+2.4	4 24 25.49	+55 38 29.5	+0.15	−14.9	»
22.95005	14.8	290	−0.30	+1.9	4 30 39.53	+55 30 44.0	+0.16	−0.2	»
23.94758	10.6	292	−0.30	+2.0	4 33 38.98	+55 26 38.5	+0.37	−0.9	»
24.92072	d10.8	292	−0.27	+2.3	4 36 30.54	+55 22 31.3	+0.21	−4.2	»
25.94518	8.6	292	−0.29	+2.0	4 39 28.17	+55 18 14.3	+0.07	+0.1	»
26.92612	10.8	294	−0.28	+2.2	4 42 16.07	+55 13 57.5	+0.33	−2.0	»
27.92778	10.8	296	−0.28	+2.2	4 45 3.94	+55 9 35.1	+0.16	−0.4	»
28.94625	10.8	296	−0.29	+1.9	4 47 51.89	+55 5 0.3	+0.10	−3.0	»
July 1.95052	d10.8	297	−0.29	+1.8	4 55 51.38	+54 51 19.1	+0.17	−4.5	»
9.95016	10.6	298	−0.28	+1.7	5 15 14.49	+54 13 51.3	−0.02	−0.2	»
10.95159	10.6	298	−0.28	+1.6	5 17 29.39	+54 9 7.5	+0.04	−0.2	»
11.92714	12.6	300	−0.27	+1.9	5 19 38.77	+54 4 31.8	+0.21	+0.3	»
12.92236	16.8	300	−0.27	+1.9	5 21 48.55	+53 59 47.3	+0.37	−1.5	»
16.93015	d10.8	301	−0.27	+1.8	5 30 7.61	+53 41 5.1	+0.18	−3.6	»
17.93186	10.7	302	−0.27	+1.7	5 32 6.12	+53 36 31.7	−0.35	−0.2	»
17.94520	d10.8	305	−0.28	+1.6	5 32 8.95	+53 36 29.2	+0.39	+0.6	»
18.91209	d10.8	308	−0.26	+2.0	5 34 1.53	+53 32 3.7	+0.01	+0.9	»
18.92905	d10.8	309	−0.27	+1.6	5 34 3.32	+53 31 57.5	−0.10	−0.6	»
19.92512	10.6	309	−0.27	+1.8	5 35 58.14	+53 27 24.1	+0.07	−2.3	»
19.94189	10.6	308	−0.27	+1.6	5 35 59.84	+53 27 19.1	−0.06	−2.7	»
22.95933	12.8	314	−0.28	+1.3	5 41 33.51	+53 13 52.0	−0.58	+0.5	»
23.93552	d8.6	314	−0.27	+1.6	5 43 18.68	+53 9 34.7	−0.05	+0.9	»
23.94978	10.6	314	−0.27	+1.4	5 43 20.10	+53 9 30.3	−0.10	+0.3	»
25.96031	d10.8	317	−0.27	+1.2	5 46 49.13	+53 0 49.0	+0.02	+2.1	»
26.94858	d10.7	319	−0.27	+1.4	5 48 29.21	+52 56 33 8	+0.19	+0.3	»
27.96644	10.8	320	−0.27	+1.1	5 50 9.06	+52 52 12.1	−0.39	−3.5	»
28.96560	d10.8	322	−0.27	+1.1	5 51 47.48	+52 48 3.4	+0.44	−2.0	»
29.95746	12.8	323	−0.27	+1.2	5 53 21.27	+52 43 59.2	+0.02	−0.7	»
30.94422	d10.8	325	−0.27	+1.3	5 54 53.47	+52 39 59.0	+0.04	+0.4	»
Aug. 12.91648	10.8	327	−0.26	+1.4	6 12 21.09	+51 52 26.4	−0.16	+3.5	»
13.95810	10.8	327	−0.26	+0.9	6 13 31.94	+51 49 3.7	−0.33	+1.9	»
14.94911	12.8	326	−0.26	+0.9	6 14 38.43	+51 45 53.2	−0.05	−1.2	»
20.95973	10.8	333	−0.25	+0.7	6 20 41.22	+51 28 27.6	−0.14	+0.8	»
21.96811	10.8	333	−0.25	+0.6	6 21 35.74	+51 25 46.5	−0.19	+0.4	»

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
Aug. 24.95869	10.8	334	−0^s.25	+0″.6	6^{h}24^m 6^s.83	+51° 18′ 14″.4	−0^s.30	+2″.7	P
26.96535	10.8	335	−0.24	+0.5	6 25 38.95	+51 13 35.5	−0.49	+1.9	»
27.96825	d10.8	335	−0.24	+0.4	6 26 22.45	+51 11 22.0	−0.57	+2.6	»
Sept. 10.00395	10.8	339	−0.19	−0.1	6 32 59.18	+50 48 36.9	−0.55	−0.3	»
10.97017	10.8	339	−0.21	+0.1	6 33 15.95	+50 47 25.6	−0.39	+2.3	»
16.95801	d10.8	338	−0.21	0.0	6 34 16.06	+50 41 1.7	−0.48	+1.0	»
16.97114	d10.8	339	−0.19	−0.1	6 34 16.31	+50 41 1.5	−0.36	+1.5	»
17.95848	d10.8	338	−0.21	0.0	6 34 18.92	+50 40 7.0	−0.48	−1.2	»
17.96539	d10.8	339	−0.20	−0.1	6 34 19.09	+50 40 6.7	−0.38	−1.1	»
17.97485	d10.8	340	−0.19	−0.1	6 34 18.89	+50 40 3.8	−0.52	−3.5	»
18.90826	d10.8	338	−0.24	+0.5	6 34 19.62	+50 39 22.1	−0.53	+1.1	»
18.91722	d10.8	339	−0.24	+0.4	6 34 19.70	+50 39 20.0	−0.48	−0.6	»
18.92880	d10.8	340	−0.23	+0.3	6 34 19.41	+50 39 19.4	−0.67	−0.6	»
Oct. 8.83652	d10.8	336	−0.25	+0.6	6 26 57.10	+50 28 16.5	−0.43	−0.4	»
14.89889	d10.8	332	−0.20	−0.1	6 21 40.54	+50 24 8.4	−1.17	+5.8	»
16.86875	d10.8	330	−0.22	0.0	6 19 39.23	+50 22 12.7	−0.29	+2.4	»
19.98288	d10.8	329	−0.03	−0.7	6 16 8.25	+50 18 32.5	−0.72	+1.6	»
Nov. 6.78084	d10.8	321	−0.22	+0.2	5 49 44.18	+49 31 8.0	−0.10	−0.8	»
7.83574	d10.8	318	−0.15	−0.4	5 47 52.71	+49 26 27.6	−0.56	+1.7	»
8.85759	d10.8	316	−0.12	−0.5	5 46 3.96	+49 21 36.5	−0.64	−0.7	»
11.82407	d18.12	313	−0.15	−0.4	5 40 42.38	+49 6 16.1	−0.45	+1.8	»
12.82403	d10.8	311	−0.14	−0.4	5 38 52.29	+49 0 32.9	−0.26	−1.1	»
13.83106	d10.9	310	−0.12	−0.5	5 36 59.67	+48 54 42.1	−0.70	+5.9	»
15.81860	d10.10	307	−0.13	−0.4	5 33 12.78	+48 40 36.3	−0.26	−1.1	»

d indicates that $\Delta\alpha$ was measured directly with the micrometer.

The observations of April 8, 16, May 6, 13, 28, June 4, 11, 25, July 9, 10, 18, 23, 29, 30 and subsequently were made with the 36 in. equatorial. All the others were made with the 12 in. equatorial.

March 21. High north wind 50–60 miles per hour. — March 22. Nucleus quite sharp. — March 28. High north wind. Seeing poor. — April 10. High north wind jars telescope. Seeing poor. 11th. North wind shakes telescope. 19th. Observation stopped by clouds. 25th. High north wind disturbs telescope. 29th. Clouds and gusty wind interfere at times. — May 2. Nucleus not sharp, although the seeing is fair. 13th. Some clouds. Seeing poor. 20th, 25th and 28th. Clouds prevent a complete observation. — June 2nd. High north wind shakes telescope badly at times. 10th. Seeing poor. — July 1st. Comet faint. Can just detect nucleus. Very smoky. 11th, 12th, 16th. Comet faint and hard to mesure. — Oct. 8th. Comet very faint; difficult to measure. Sky not very pure. 14th. Comet faint and difficult 16^m.5. Seeing poor. Wind shaking telescope. — Nov. 6th. Comet very faint 16^m.75; 10″ in diameter; slightly brighter at the middle. 7th. High north wind. Some faint stars near. 12th. Comet is somewhat brighter and easier to measure, notwithstanding there is some smoke in the air. Some wind from north sways telescope. 13th. Comet very faint and difficult. Considerable haze. 15th. Comet faint and difficult; near 16^m.5 star. Comet 16^m.5–17^m.

Munich. W. Villiger.

10.5 in. refractor. A. N. 3521. Prob. error 2″.4, 1″.7; Comp. wt. 0.6, 1.0; Ass. wt. 1, 1.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
Mar. 27.60990	30.10	28	−0^s.27	+3″.7	21^{h}47^{m}24^s.52	+24° 33′ 21″.0	+0^s.36	−0″.9	V
27.62891	30.10	28	−0.27	+3.5	21 47 29.07	+24 34 39.4	+0.39	−3.2	»
28.60857	24.8	29	−0.28	+3.6	21 51 24.33	+25 34 14.1	−0.23	−1.4	»
28.62903	36.12	32	−0.27	+3.4	21 51 29.37	+25 35 28.9	−0.16	−0.9	»
April 5.60924	24.8	81	−0.29	+3.3	22 25 28.03	+33 19 4.8	−0.04	−0.1	»
5.63092	27.9	81	−0.29	+3.0	22 25 33.73	+33 20 12.9	−0.15	−5.7	»
6.61104	30.10	82	−0.29	+3.2	22 29 58.87	+34 13 43.4	−0.07	−4.5	»
6.63400	30.10	85	−0.29	+2.9	22 30 5.49	+34 15 1.6	+0.24	−0.9	»
7.58328	24.8	84	−0.29	+3.6	22 34 25.06	+35 6 4.7	+0.02	+4.1	»
7.61048	30.10	86	−0.30	+3.2	22 34 32.55	+35 7 26.2	+0.02	−1.2	»
8.55796	24.8	99	−0.29	+3.9	22 38 54.53	+35 57 24.2	−0.31	−1.7	»

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha\cos\delta$	O—C $\Delta\delta$	Obs.
April 8.55796	24.8	97	$-0^s.29$	$+3''.9$	$22^h\,38^m\,54^s.82$	$+35°\,57'\,19''.5$	$-0^s.11$	$-5''.7$	V
14.48149	30.10	119	−0.22	+4.6	23 7 21.93	+40 48 15.5	+0.33	+0.6	»
14.50501	24.8	121	−0.25	+4.3	23 7 28.33	+40 49 16.1	−0.12	−3.3	»
25.41743	3.1	158	−0.10	+4.8	0 4 6.50	+47 54 56.9	+0.19	−6.2	»
25.53553	24.8	160	−0.29	+3.7	0 4 44.44	+47 58 45.2	+0.09	−5.4	»
25.53553	24.8	163	−0.29	+3.7	0 4 44.47	+47 58 44.8	+0.11	−5.8	»
26.56364	3.1	168	−0.31	+3.2	0 10 17.19	+48 31 4.5	+0.23	−2.9	»
May 1.36934	26.9	181	0.00	+4.7	0 36 24.86	+50 44 51.4	−0.11	+1.1	»
1.41134	30.10	182	−0.08	+4.6	0 36 38.17	+50 45 49.1	−0.42	−4.1	»
2.39091	27.9	189	−0.04	+4.6	0 41 59.33	+51 9 39.8	−0.43	−3.0	»
14.40019	6.2	227	−0.03	+4.2	1 46 42.11	+54 38 35.4	−0.15	−5.8	»
15.43918	30.10	229	−0.11	+4.0	1 52 7.41	+54 50 16.9	+0.12	−4.3	»
18.41303	24.8	235	−0.05	+4.0	2 7 21.50	+55 18 54.1	−0.17	−4.5	»
22.51527	30.10	248	−0.23	+3.3	2 27 41.91	+55 47 56.2	+0.40	−1.2	»
22.54104	15.5	249	−0.27	+3.0	2 27 49.95	+55 48 4.8	+0.25	−2.3	»
25.35901	24.12	253	+0.06	+3.8	2 41 14.92	+56 1 45.0	+0.32	−1.3	»
25.38016	18.6	254	+0.02	+3.9	2 41 20.63	+56 1 50.7	+0.19	−0.8	»
June 4.37940	15.5	271	+0.03	+3.6	3 25 8.51	+56 18 23.7	+0.19	−1.9	»
21.52025	16.6	289	−0.20	+2.7	4 26 17.56	+55 36 19.9	+0.18	−5.1	»
July 16.48658	18.6	303-4	−0.17	+2.6	5 29 13.58	+53 43 6.7	−0.08	−5.1	»
18.50259	20.10	306	−0.19	+2.4	5 33 14.58	+53 33 58.4	+0.48	+3.4	»

March 27. Kern des Cometen sehr verwaschen. — March 28. Kern deutlich sichtbar. — April 7. Bilder sehr verwaschen, daher Messung unsicher. — April 8. Kern heute etwas verwaschen. — April 25. Kern des Cometen undeutlich; durch Wolken bei der ersten Beobachtung gestört. Bei der zweiten und dritten Beobachtung leichter Nebel; Comet daher schwach, Messung unsicher. — April 26, 27. Leichter Nebel. — May 2. Bilder sehr schlecht, Messung unsicher. — June 4. Comet bei Vollmond sehr schwach, Messung unsicher.

Padua. A. Antoniazzi and G. Ciscato.

187 mm equatorial. A. N. 3536.

A. Antoniazzi: Prob. error 2".1, 1".2; Comp. wt. 0.7, 2.2; Ass. wt. 1, 2.
G. Ciscato: » » 1.2, 1.9; » » 2.2, 0.9; » » 2, 1.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha\cos\delta$	O—C $\Delta\delta$	Obs.
Mar. 22.59996	5.5	11	$-0^s.28$	$+3''.7$	$21^h\,28^m\,3^s.64$	$+19°\,23'\,58''.9$	$-0^s.21$	$0''.0$	C
22.61964	5.5	7	−0.28	+3.6	21 28 8.19	+19 25 15.3	−0.09	+2.8	A
22.63128	5.5	7	−0.27	+3.5	21 28 10.58	+19 25 57.3	−0.29	+1.3	C
22.64300	5.5	11	−0.27	+3.4	21 28 13.65	+19 26 41.1	+0.12	+1.3	A
April 4.60143	5	66	−0.31	—	22 20 58.97	—	−0.03	—	»
4.60705	5	66	—	+3.3	—	+32 23 28.7	—	+1.5	»
4.61427	5	67	−0.31	—	22 21 2.28	—	−0.11	—	C
4.62030	5	67	—	+3.1	—	+32 24 12.8	—	+1.0	»
4.62789	6	67	−0.30	—	22 21 6.04	—	+0.02	—	A
4.63289	5	67	—	+3.0	—	+32 24 56.9	—	+3.0	»
4.63962	5	66	−0.30	—	22 21 8.73	—	−0.34	—	C
4.64720	5	66	—	+2.8	—	+32 25 45.1	—	+3.1	»
4.65428	5	68	−0.29	—	22 21 13.11	—	+0.07	—	»
4.65860	5	68	—	+2.6	—	+32 26 23.4	—	+3.2	»
4.66444	13	68	−0.28	—	22 21 15.94	—	+0.19	—	A
7.61463	5.5	86	−0.31	+3.0	22 34 33.71	+35 7 37.7	+0.03	−2.9	»
7.63050	5.5	86	−0.31	+2.8	22 34 37.80	+35 8 28.0	−0.20	−3.4	C
7.64828	4.4	95	−0.30	+2.5	22 34 42.61	+35 9 23.5	−0.26	−4.6	»
7.65785	2.2	95	−0.29	+2.4	22 34 45.39	+35 9 56.2	−0.15	−2.4	A
8.63864	8.7	90	−0.31	+2.5	22 39 17.53	+36 1 37.2	−0.08	−1.6	»
12.62638	10.10	111	−0.32	+2.6	22 58 15.05	+39 21 22.1	−0.06	−0.5	C

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O−C $\Delta\alpha\cos\delta$	O−C $\Delta\delta$	Obs.
April 13.61069	10.5	116	−0ˢ.33	+2″.8	23ʰ 3ᵐ 3ˢ.70	+40° 7′ 59″.0	−0ˢ.01	+ 1″.0	C
14.61148	10.5	119	−0.33	+2.8	23 8 0.02	+40 54 7.8	−0.11	− 3.3	»
May 2.49726	10.10	186	−0.25	+3.9	0 42 35.55	+51 12 11.7	+0.41	− 2.4	A
2.53706	8.8	190	−0.30	+3.4	0 42 48.71	+51 13 6.1	+0.48	−14.3	»
10.48355	10.10	218	−0.21	+3.9	1 25 57.17	+53 46 11.5	+0.02	− 2.8	C
14.50678	10.10	227	−0.29	+3.1	1 47 16.20	+54 39 54.1	+0.23	− 1.4	A
14.54090	6.6	223	−0.33	+2.9	1 47 27.29	+54 40 16.8	+0.45	− 2.4	»
15.46604	10.5	229	−0.17	+3.9	1 52 16.31	+54 50 37.3	+0.42	− 1.3	C
16.50927	10.6	232	−0.24	+3.5	1 57 40.14	+55 1 26.1	+0.65	− 0.7	A
16.53285	5.5	234	−0.28	+3.2	1 57 46.98	+55 1 39.8	+0.40	− 1.0	»
20.44395	10.10	244	−0.12	+3.9	2 17 32.06	+55 34 45.9	+0.02	+ 1.0	C
24.54221	20.5	252	−0.28	+2.9	2 37 24.47	+55 58 14.8	+0.49	− 2.3	A
26.54928	10.10	255	−0.28	+2.8	2 46 46.74	+56 6 12.2	+0.22	+ 0.4	»
31.55890	3.3	262	−0.31	+2.1	3 9 7.30	+56 17 6.6	−0.11	− 2.6	»

April 4. La cometa appare come una stella sfocata di 7ª grandezza. L'ultima osservazione viene interrotta dall' alba che impedisce di prendere i confronti in declinazione.

April 7. Nell' ultima osservazione, dopo due buoni confronti, la cometa non si vede più in causa della luce diurna.

April 12. Osservazione contrastate da nubi; causa la scorsa serenita la cometa si vede senza nucleo distinto.

April 13. Sereno velato. Osservazioni difficili.

April 14. Sereno vario. Osservazione buona.

May 2. Sereno. Osservazioni abbastanza facili.

May 10. Sereno fosco. Da principio la cometa è osservabile senza grande sforzo, ma poi lo stato del cielo, peggiorando, rende le osservazioni difficilissime.

May 14. Sereno, ma il nucleo essendo poco distinto, le osservazioni riescono difficili.

May 24 and 26. Osservazioni alquanto difficili per la mancanza del nucleo visibile nella cometa.

May 31. Osservazione difficilissima sospesa dall' alba.

Paris. G. Bigourdan and G. Fayet.

0ᵐ.305 equatorial. C. R. 126.943; B. A. 16.170.

Bigourdan: Ass. wt. 1, 2. Fayet: Prob. error 1″.6, 1″.6; Comp. wt. 1.2, 1.3; Ass. wt. 1, 1.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O−C $\Delta\alpha\cos\delta$	O−C $\Delta\delta$	Obs.
Mar. 21.64872	4.4	5	−0ˢ.24	+3″.8	21ʰ 24ᵐ 31ˢ.95	+18° 24′ 39″.3	+0ˢ.03	+0″.6	B
21.65571	4.4	5	−0.25	+3.7	21 24 33.22	+18 25 5.4	−0.24	+0.6	»
21.67098	4.4	5	−0.25	+3.6	21 24 36.57	+18 26 2.7	−0.26	+0.6	»
21.67578	4.4	5	−0.25	+3.6	21 24 37.88	+18 26 20.3	−0.03	+0.3	»
22.67485	15.10	11	−0.25	+3.6	21 28 20.33	+19 28 39.7	−0.31	+0.8	F
24.64224	12.6	16	−0.26	+3.8	21 35 47.49	+21 30 54.4	+0.06	−2.4	»
24.64224	12.6	14	−0.26	+3.8	21 35 47.46	+21 30 54.3	+0.03	−2.5	»
24.67124	12.8	14	−0.25	+3.5	21 35 54.35	+21 32 43.7	−0.07	−0.5	»
24.67124	12.8	16	−0.25	+3.5	21 35 54.25	+21 32 44.6	−0.16	+0.4	»
April 1.67282	8.8	52	−0.27	+3.1	22 8 15.97	+29 35 48.4	−0.28	−6.0	»
5.64969	12.8	81	−0.29	+3.2	22 25 38.76	+33 21 15.2	−0.16	−3.3	»
5.64969	12.8	75	−0.29	+3.2	22 25 39.21	+33 21 17.6	+0.22	−0.9	»
7.59844	12.10	86	−0.29	+3.8	22 34 28.89	+35 6 48.9	−0.26	−0.1	»
13.57873	8.8	116	−0.29	+3.8	23 2 54.27	+40 6 25.7	−0.02	−2.6	»
22.54010	8.8	145	−0.26	+4.0	23 48 44.87	+46 17 13.2	+0.04	−2.0	»
26.48738	8.8	165	−0.18	+4.4	0 9 51.99	+48 28 37.6	−0.10	−8.8	»

April 5. Malgré la présence de la Lune, qui est très forte, la comète s'aperçoit très bien. Son noyau, d'aspect stellaire, ressort vivement. — April 6. Mesures un peu incertaines à cause de la faiblesse de l'étoile de comparaison et aussi du peu de hauteur de la comète.

Philadelphia. H. B. Evans.

18 in. equatorial. A. J. 441. Prob. error 1″.5, 1″.1; Comp. wt. 1.4, 2.7; Ass. wt. 1, 2.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
Mar. 31.89110	8.12	51	−0ˢ.31	+2″.5	22ʰ 4ᵐ 57ˢ.51	+28° 50′ 10″.5	0ˢ.00	− 2″.0	E
31.89110	8.12	50	−0.31	+2.5	22 4 57.31	+28 50 10.1	−0.18	− 2.4	»
April 1.86994	7.11	52	−0.32	+2.7	22 9 6.46	+29 47 19.8	−0.24	− 2.0	»
1.86994	6	53	−0.32	—	22 9 6.64	—	−0.09	—	»
2.83737	4	56	−0.33	+3.1	22 13 16.13	+30 43 5.7	−0.02	− 5.8	»
2.83737	4	64	−0.33	+3.1	22 13 16.13	+30 43 6.0	−0.02	− 5.5	»
3.85128	7.8	69	−0.33	+2.9	22 17 40.63	+31 41 14.2	−0.23	[+17.7]	»
5.85575	7.8	76	−0.34	+2.7	22 26 34.37	+33 32 35.4	−0.03	− 2.6	»
6.85307	8	88	−0.34	+2.8	22 31 4.78	+34 26 51.7	−0.09	− 1.1	»
7.85664	8	89	−0.34	+2.7	22 35 40.36	+35 20 30.2	−0.05	− 1.4	»
8.87660	8	103	−0.34	+2.3	22 40 23.64	+36 14 0.5	−0.18	− 1.7	»
11.87778	8	108	−0.34	+2.2	22 54 37.56	+38 45 11.9	−0.09	− 0.3	»
12.83925	8	113	−0.35	+2.8	22 59 17.05	+39 31 28.2	−0.17	− 4.6	»
13.83189	4	115	−0.35	+2.8	23 4 9.38	+40 18 13.9	+0.31	− 3.0	»
May 9.83641	8	215	−0.38	+2.3	1 22 28.79	+53 36 12.8	+0.05	+ 0.5	»
9.83641	8	214	−0.38	+2.3	1 22 28.77	+53 36 12.0	+0.04	− 0.3	»
11.81909	9	220	−0.36	+2.5	1 33 5.16	+54 5 40.4	+0.05	− 0.8	»
13.81852	10	224	−0.36	+2.5	1 43 39.65	+54 31 43.1	+0.13	− 2.5	»
13.84114	8	222	−0.37	+2.2	1 43 46.83	+54 32 1.5	+0.16	− 0.6	»
17.82610	9	235	−0.36	+2.4	2 4 23.28	+55 13 52.0	−0.10	+ 0.2	»
17.82793	8	236	−0.36	+2.3	2 4 23.84	+55 13 53.5	+0.10	+ 0.7	»
31.80910	10	264	−0.32	+2.5	3 10 12.48	+56 17 22.2	+0.23	− 2.3	»
June 22.79588	8	290	−0.27	+2.3	4 30 11.07	+55 31 18.8	−0.12	− 2.7	»
23.80232	8	291	−0.28	+2.2	4 33 12.33	+55 27 14.1	−0.06	− 0.7	»
23.80232	8	290	−0.28	+2.2	4 33 12.24	+55 27 14.3	−0.11	− 1.1	»
24.79491	5.8	292	−0.27	+2.3	4 36 8.19	+55 23 5.8	+0.05	− 1.4	»
24.81555	8	292	−0.28	+2.1	4 36 10.93	+55 23 2.7	−0.05	− 0.3	»

May 13. $\Delta\delta$ corrected by observer. — June 22. $\Delta\delta$ given with wrong sign. Corrected by observer.

Pola. K. Stockert.

6 in. refractor, filar micrometer. A. N. 3488, 3542. Ass. wt. 1, ½.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
Mar. 22.64446	30.6	11	−0ˢ.27	+3″.3	21ʰ 28ᵐ 13ˢ.27	+19° 26′ 45″.9	−0ˢ.55	+ 0″.8	S
23.65155	20.4	13	−0.26	+3.2	21 32 0.90	+20 29 12.5	−0.28	[−14.2]	»
26.63536	15.3	22	−0.28	+3.2	21 43 32.12	+23 33 38.2	−0.30	[−16.3]	»
April 6.57199	25.5	80	−0.31	+3.5	22 29 48.09	+34 11 37.1	−0.04	− 1.6	»

Mar. 22. Luft 1–2, böiger Wind. — Mar. 23. Luft 2–3, feiner Wolkenschleier. — Mar. 26. Luft 2–3, Wolkenschleier.

Poughkeepsie. Mary Whitney and Caroline Furness.

12 in. equatorial. A. J. 433, 437. Ass. wt. 1, 1.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
Mar. 25.89181	12	20	−0ˢ.29	+2″.9	21ʰ 40ᵐ 37ˢ.69	+22° 48′ 5″.1	+0ˢ.01	−5″.4	W
25.90120	11	20	−0.28	+2.8	21 40 39.75	+22 48 40.3	−0.11	−5.0	F
April 3.89780	5	63	−0.30	+2.5	22 17 52.65	+31 43 30.5	−0.42	−3.7	»
7.87311	11	89	−0.33	+2.5	22 35 44.87	+35 21 20.8	−0.08	−3.0	»
8.87339	10	98	−0.33	+2.4	22 40 23.36	+36 13 52.5	+0.31	+0.3	»
12.87094	10	113	−0.34	+2.3	22 59 26.19	+39 33 2.8	−0.28	−0.6	»

April 3. Wrong star given by observer.

Pulkova. A. Sokolow.

15 in. equatorial. A. N. 3515. Prob. error 1″0, 1″1; Comp. wt. 2.9, 2.7; Ass. wt. 2, 2.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
April 6.48922	15	82	−0ˢ.21	—	22ʰ 29ᵐ 25ˢ.53	—	−0ˢ.25	—	S
6.48927	21	85	−0.21	—	22 29 25.69	—	−0.13	—	»
6.49842	2	85	—	+4″.4	—	+34° 7′ 39″.9	—	−1″.8	»
11.43872	28.4	106	−0.17	+4.7	22 52 30.79	+38 23 38.8	−0.12	−2.9	»
13.47715	14.8	116	−0.21	+4.3	23 2 24.21	+40 1 40.9	−0.13	−1.8	»
14.39514	28.4	118	−0.13	+4.9	23 6 55.81	+40 44 17.2	−0.01	−0.4	»
15.44920	28.4	125	−0.18	+4.5	23 12 10.35	+41 31 54.6	−0.18	−2.9	»
23.40689	28.4	148	−0.14	+4.5	23 53 20.63	+46 47 45.7	−0.15	−2.9	»
24.44988	28.4	153	−0.18	+4.2	23 58 54.82	+47 23 17.7	+0.01	−1.9	»
25.41583	14	158	−0.14	—	0 4 6.03	—	+0.23	—	»
25.42547	1	158	—	+4.3	—	+47 55 12.2	—	−6.5	»
28.46383	28.4	170	−0.20	+3.8	0 20 34.40	+49 27 19.0	−0.24	−1.5	»
29.40892	28.4	172	−0.14	+4.2	0 25 43.17	+49 53 38.0	−0.08	−1.6	»
May 1.41541	14	181	−0.14	—	0 36 40.00	—	−0.11	—	»
1.43269	4	181	—	+4.0	—	+50 46 23.6	—	−1.3	»
2.43797	28.4	186	−0.17	+3.9	0 42 15.48	+51 10 48.3	+0.02	−1.5	»
4.40679	8.8	196	−0.13	+4.0	0 53 0.94	+51 55 18.1	+0.02	+0.4	»
8.38725	8.8	209	−0.09	+4.0	1 14 39.83	+53 12 14.5	+0.01	−0.5	»
8.38725	8.8	208	−0.09	+4.0	1 14 39.84	+53 12 14.9	+0.01	−0.1	»
16.40284	8	232	−0.11	—	1 57 6.31	—	+0.10	—	»
19.41221	16.8	237	−0.11	+3.4	2 12 23.56	+55 27 4.9	−0.01	−1.1	»
20.40964	35.4	241	−0.11	+3.6	2 17 21.66	+55 34 27.8	−0.08	−2.6	»

May 16–20. Ohne Kern. Hell. Comet schwach.

Rome (Coll. Romano). E. Millosevich.

Filar micrometer. A. N. 3489. Ass. wt. 1, 1.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
April 3.60976	6.2	54	−0ˢ.32	+3″.0	22ʰ 16ᵐ 37ˢ.46	+31° 27′ 11″.8	−0ˢ.05	−3″.7	M
9.52910	15.5	100	−0.30	+3.9	22 43 27.10	+36 47 46.9	+0.08	+4.0	»

Strassburg. H. Kobold.

18 in. refractor. A. N. 3486 and 3529. Prob. error 1″.5, 1″.0; Comp. wt. 1.4, 3.2; Ass. wt. 1, 2.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
Mar. 21.65772	20.8	3	−0ˢ.25	+3″.6	21ʰ 24ᵐ 33ˢ.68	+18° 25′ 14″.1	−0ˢ.22	+1″.7	K
21.65772	20.8	5	−0.25	+3.6	21 24 33.63	+18 25 13.0	−0.27	+0.6	»
26.62626	15.6	25	−0.27	+3.7	21 43 30.08	+23 33 19.8	−0.21	−1.1	»
26.62626	15.6	27	−0.27	+3.7	21 43 30.44	+23 33 20.2	+0.12	−0.7	»
30.62348	15.6	38	−0.28	+3.6	21 59 39.27	+27 35 14.6	−0.17	−1.3	»
30.62348	15.6	43	−0.28	+3.6	21 59 39.22	+27 35 13.7	−0.21	−2.2	»
April 5.61102	15.6	75	−0.29	+3.4	22 25 28.67	+33 19 10.3	+0.09	−0.5	»
5.61102	15.6	81	−0.29	+3.4	22 25 28.27	+33 19 8.2	−0.24	−2.6	»
8.62896	15.6	83	−0.29	+3.1	22 39 14.47	+36 1 8.4	−0.21	0.0	»
8.62896	15.6	90	−0.29	+3.1	22 39 14.43	+36 1 8.1	−0.24	−0.3	»
14.48461	15.6	119	−0.21	+4.7	23 7 22.27	+40 48 23.2	−0.36	−0.2	»
14.48461	15.6	118	−0.21	+4.7	23 7 22.65	+40 48 21.5	−0.08	−1.9	»
May 13.45687	20.8	222	−0.13	+4.0	1 41 45.21	+54 27 18.8	−0.05	+0.4	»
20.46986	20.8	244	−0.14	+3.8	2 17 39.73	+55 34 54.6	+0.01	−1.3	»
27.39636	15.6	255	+0.01	+3.8	2 50 39.89	+56 8 54.0	+0.20	+0.5	»

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
June 20.43717	15.6	289	−0ˢ.06	+3″.3	4ʰ22ᵐ54ˢ.74	+55° 40′ 32″.8	+0ˢ.11	−11″.7	K
20.43717	15.6	288	−0.06	+3.3	4 22 54.42	+55 40 33.5	−0.07	−11.0	»
July 12.47091	20.8	299	−0.13	+2.8	5 20 49.98	+54 1 57.2	+0.31	− 0.6	»
12.47091	20.8	300	−0.13	+2.8	5 20 49.85	+54 1 56.9	+0.24	− 0.9	»
15.47353	20.8	304	−0.14	+2.8	5 27 10.03	+53 47 52.6	+0.12	− 1.5	»
15.47353	20.8	303	−0.14	+2.8	5 27 10.14	+53 47 52.5	+0.19	− 1.6	»

May 27. Bei Mondschein und sehr schlechter Luft ist der Comet nur mit ziemlicher Mühe zu erkennen als ein blasser Nebel mit einer im vorangehenden Theile liegenden Verdichtung. Beobachtung unsicher. — June 20. Comet noch ziemlich hell, aber nur wenig verdichtet. Beobachtung ziemlich schwierig. — July 12. Kern nicht zu erkennen. Bilder sehr schlecht.

Toulouse. F. Rossard.

C. R. 126.944. Ass. wt. 1, 1.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
Mar. 25.64882	20.18	19	−0ˢ.29	+3″.3	21ʰ39ᵐ41ˢ.11	+22° 33′ 8″.1	+0ˢ.18	−3″.5	R
25.64882	20.18	21	−0.29	+3.3	21 39 40.90	+22 33 6.8	−0.02	−4.8	»

Utrecht. A. A. Nijland.

26 cm refractor. A. N. 3561. Prob. error 1″.2, 1″.2; Comp. 2.2, 2.2; Ass. wt. 2, 2.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
Mar. 31.62953	8.4	44	−0ˢ.26	+3″.7	22ʰ 3ᵐ51ˢ.41	+28° 38′ 10″.8	−0ˢ.03	− 4″.2	N
April 1.64027	8.4	49	−0.26	+3.6	22 8 8.84	+29 33 57.8	+0.76	− 2.9	»
6.59808	10.4	85	−0.27	+3.8	22 29 55.52	+34 13 3.1	+0.08	− 2.7	»
13.54014	12.5	116	−0.25	+4.2	23 2 42.98	+40 4 39.4	+0.04	− 0.4	»
20.54320	8.4	134	−0.25	+4.0	23 38 14.87	+45 3 12.3	+0.16	− 2.9	»
21.54612	1.1	143	−0.26	+3.9	23 43 30.09	+45 41 1.3	+0.01	− 1.5	»
21.56444	8.3	143	−0.27	+3.7	23 43 35.87	+45 41 43.9	+0.01	+ 0.4	»
23.57964	12.4	151	−0.28	+3.4	23 54 16.14	+46 53 46.2	+0.14	− 1.1	»
24.56948	10.3	155	−0.22	+3.5	23 59 29.63	+47 32 9.4	+0.10	[+58.4]	»
27.56590	10.3	167	−0.28	+3.5	0 15 42.43	+49 1 19.3	+0.09	− 0.4	»
May 1.50752	8.4	182	−0.21	+4.0	0 37 10.50	+50 48 14.6	+0.08	− 1.8	»
11.45865	12.4	219	−0.11	+4.1	1 31 9.99	+54 0 36.6	+0.06	+ 0.5	»
12.54694	10.3	221	−0.24	+3.3	1 36 57.06	+54 15 32.8	+0.08	− 2.7	»
22.51798	8.4	248	−0.19	+3.4	2 27 42.74	+55 47 56.8	+0.42	− 1.5	»
23.53471	12.4	249	−0.21	+3.2	2 32 36.64	+55 53 25.9	+0.42	− 1.5	»

April 1, 24, 27, May 11, 23. Kern nicht ganz scharf. — April 21. Erste Beobachtung. Der Comet ging $13^h 41^m 22^s$ über den Doppelstern BD. +45°4335 = AG. Bonn 18176 hinweg, und zwar theilte der Kern den Abstand der Componenten im Verhältniss von 3 : 5. Aus dieser Beobachtung habe ich die Werthe −0ˢ.59, +6″.4 hergeleitet.

March 31. Micrometer reading in $\Delta\delta$ corrected 10^R by observer. — April 24. Star corrected by observer.

Vienna. F. Bidschof and J. Holetschek.

83 cm equatorial coudé (B) and 6 in. Fraunhofer (H). A. N. 3485 and 3524. Ass. wt. 1, 1.

1898 Gr. M. T.	No Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O—C $\Delta\alpha \cos\delta$	O—C $\Delta\delta$	Obs.
Mar. 21.57376	20.5	5	−0ˢ.26	+4″.0	21ʰ24ᵐ15ˢ.02	+18° 19′ 59″.9	−0ˢ.37	+1″.8	B
21.61847	10.3	4	−0.26	+3.7	21 24 24.69	+18 22 44.6	−0.50	−0.7	»
21.63377	6	4	−0.25	+3.6	21 24 28.34	+18 23 41.3	−0.25	−1.4	H
21.63758	9	5	−0.25	—	21 24 29.54	—	+0.03	—	B
21.64090	3	5	—	+3.6	—	+18 24 9.5	—	+0.1	»

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O−C $\Delta\alpha\cos\delta$	O−C $\Delta\delta$	Obs.
Mar. 23.59485	20.4	10	−0ˢ.26	+3″.8	21ʰ31ᵐ48ˢ.33	+20° 25′ 49″.3	+0ˢ.02	−6″.1	B
23.61266	15.3	10	−0.26	+3.7	21 31 52.05	+20 26 59.7	−0.29	−2.1	»
27.61801	6	28	−0.27	+3.5	21 47 25.84	+24 33 56.7	−0.19	−5.8	H
28.61054	6	36	−0.27	+3.5	21 51 24.57	+25 34 24.7	−0.45	+2.0	»
31.61803	6	44	−0.28	+3.3	22 3 48.76	+28 34 11.4	+0.18	+2.4	»

Washington. E. Frisby.

12 in. equatorial. A. J. 440. Prob. error 3″.3, 3″.6; Comp. wt. 0.3, 0.2; Ass. wt. 1/2, 1/2.

1898 Gr. M. T.	No. Comp.	*	Parallax in α	Parallax in δ	Geocentric Place α	Geocentric Place δ	O−C $\Delta\alpha\cos\delta$	O−C $\Delta\delta$	Obs.
Mar. 25.91122	10.2	18	−0ˢ.29	+2″.6	21ʰ40ᵐ41ˢ.70	+22° 49′ 11″.4	−0ˢ.47	−10″.9	F
April 1.87074	20.4	52	−0.33	+2.7	23 0 6.63	+29 47 19.6	−0.28	− 5.0	»
3.88705	20.4	63	−0.33	+2.4	22 17 49.88	+31 42 56.2	−0.36	+ 0.3	»
6.82704	20.4	88	−0.34	+3.3	22 30 58.04	+34 25 28.6	+0.26	[−19.9]	»
8.84667	10.2	92	−0.35	+2.8	22 40 14.65	+36 12 34.0	−0.69	+ 5.1	»
12.81955	18.4	111	−0.35	+3.1	22 59 12.81	+39 30 29.0	[+1.29]	− 7.4	»
20.80638	10.2	136	−0.36	+3.0	23 39 37.16	+45 13 14.9	−0.03	− 2.7	»
20.80638	10.2	134	−0.36	+3.0	23 39 37.15	+45 13 12.5	−0.04	− 5.1	»
29.76232	14.3	176	−0.31	+3.7	0 27 38.38	+50 3 7.4	−0.30	− 6.1	»
May 17.73141	20.4	235	−0.22	+3.7	2 3 53.69	+55 12 58.2	−0.45	− 2.7	»
18.72929	17.4	235	−0.22	+3.7	2 8 57.98	+55 21 25.5	+0.20	−12.0	»

April 6. $\Delta\alpha$ and time corrected by observer. — April 12. Sign of $\Delta\alpha$ changed by observer.

§ 7. Formation of Normal Places.

With the residuals thus weighted nine normal places were formed. On arranging the residuals chronologically it was at once seen that agreement between computation and observation was so uniform that the assumption of any function other than a linear one for the differences between computation and observation would be an unnecessary refinement. Accordingly the simple formula

$$v_0 = \frac{p_1 v_1 + p_2 v_2 + \cdots}{p_1 + p_2 + \cdots}$$

was used.

The comet did not pass near any of the planets. However, the perturbations in rectangular coordinates were computed at intervals of sixteen days during the apparition period for all the planets except Uranus and Neptune. The following table gives the residuals on the normal dates, the perturbations and the weights.

Epoch of osculation: March 31.0.

No.	1898	$\Delta\alpha\cos\delta$	Pert.$_\alpha$	n	wt.	$\Delta\delta$	Pert.$_\delta$	n	wt.	Observations from	Observations to
I	Mar. 25.5	−1″.65	+0″.002	−1″.65	132.5	−1″.20	−0″.001	−1″.20	153.0	Mar. 19	Mar. 31
II	April 14.0	−0.72	+0.005	−0.72	291.0	−2.18	−0.011	−2.17	331.5	April 1	April 30
III	May 15.0	+1.22	+0.053	+1.17	170.0	−1.57	−0.141	−1.43	220.0	May 1	May 31
IV	June 16.0	+2.34	−0.387	+2.73	51.0	−1.90	−0.259	−1.64	83.0	June 1	June 30
V	July 18.5	+0.98	−0.954	+1.93	27.0	−0.79	−0.243	−0.55	54.0	July 1	July 31
VI	Aug. 20.5	−4.18	−1.786	−2.39	8.0	+1.58	−0.147	+1.73	16.0	Aug. 12	Aug. 28
VII	Sept. 16.5	−7.26	−2.725	−4.54	10.0	−0.14	−0.100	−0.04	20.0	Sept. 10	Sept. 19
VIII	Oct. 15.5	−9.78	−4.042	−5.74	4.0	+2.35	−0.332	+2.68	8.0	Oct. 8	Oct. 19
IX	Nov. 11.5	−6.30	−5.330	−0.97	7.0	+0.81	−0.452	+1.26	14.0	Nov. 6	Nov. 15

Whence the following normal places:

No.	1898	α 1898.0	δ 1898.0
I	Mar. 25.5	324° 46′ 11″.47	+22° 23′ 52″.91
II	April 14.0	346 14 17.87	+40 25 52.42
III	May 15.0	27 26 58.95	+54 45 17.11
IV	June 16.0	62 5 22.77	+55 55 51.88
V	July 18.5	83 17 19.15	+53 33 50.59
VI	Aug. 20.5	95° 2′ 46″.65	+51° 29′ 42″.15
VII	Sept. 16.5	98 32 23.82	+50 41 25.89
VIII	Oct. 15.5	95 14 52.91	+50 23 32.42
IX	Nov. 11.5	85 18 18.12	+49 7 58.91

§ 8. Least Square Solution.

The differential coefficients were computed by Oppolzer's formulae (Lehrbuch zur Bahnbestimmung, Band II, S. 405–6). After multiplying each equation by the square root of its weight and rendering homogeneous, these coefficients are as follows.

Equations of condition (coefficients logarithmic).

I	$9.77917_n\,x$	$+ 9.67270_n\,y$	$+ 9.66641\,z$	$+ 8.42918\,t$	$+ 9.42367_n\,u$	$+ 9.08014\,w$	$= 9.68189_n$
II	0.00000_n	0.00000_n	0.00000	9.74022_n	9.40105_n	9.68583	$= 9.49257_n$
III	9.71248_n	9.88404_n	9.88801	9.78051_n	9.63776	9.18409	$= 9.58671$
IV	8.97788_n	9.38519_n	9.41181	9.05115_n	9.66815	9.34854_n	$= 9.69324$
V	7.25151	8.89023_n	8.96396	8.86010	9.58689	9.53754_n	$= 9.40454$
VI	8.23612	8.15285_n	8.36303	9.00107	9.34583	9.45102_n	$= 9.23324_n$
VII	8.36371	7.97502_n	8.36754	9.18831	9.42126	9.61890_n	$= 9.56036_n$
VIII	8.00328	8.22788_n	8.52812	9.06595	9.26221	9.52402_n	$= 9.46324_n$
IX	7.34420_n	8.75192_n	8.98950	9.18330	9.40554	9.68443_n	$= 8.81262_n$
I	9.96924_n	8.24865	9.81661	9.94678_n	9.48930	9.32601	$= 9.57482_n$
II	9.90132_n	8.81982_n	9.73519	0.00000_n	9.99505	9.81392	$= 0.00000_n$
III	9.00897	9.61681	9.52004_n	9.00904	0.00000	9.52407	$= 9.72985_n$
IV	9.29238	9.67397	9.70323_n	9.61896	9.59492	9.58056	$= 9.57768_n$
V	9.18621	9.63974	9.71840_n	9.63212	9.22061	9.81629	$= 9.00986_n$
VI	8.88553	9.40832	9.52865_n	9.42052	8.67072	9.76905	$= 9.24341$
VII	8.93193	9.49068	9.63965_n	9.52401	8.60370	9.94279	$= 7.65588_n$
VIII	8.75606	9.33084	9.50461_n	9.40855	8.59714	9.83291	$= 9.28297$
IX	8.87810	9.46520	9.65865_n	9.61628	9.02069	0.00000	$= 9.07673$

Here

$$
\begin{aligned}
x &= [9.18356]\,\mathrm{d}T\\
y &= [1.45623]\,\mathrm{d}\log q\\
z &= [1.00686]\,\mathrm{d}\pi'\\
t &= [1.01101]\,\sin i'\,\mathrm{d}\Omega'\\
u &= [0.95456]\,\mathrm{d}i'\\
w &= [0.15932]\,\mathrm{d}e\\
&\log \text{ unit error} = 1.59670.
\end{aligned}
$$

These coefficients were checked by duplicate calculation. In addition the geocentric places of the comet for the normal dates were computed from the elements affected with the following increments:

$$
\begin{aligned}
\mathrm{d}T &= +0^{d}001\\
\mathrm{d}\log q &= +0.0000100\\
\mathrm{d}\pi &= +10'' \qquad \mathrm{d}\pi' = +6''.29\\
\mathrm{d}\Omega &= +10'' \qquad \mathrm{d}\Omega' = +4.77\\
\mathrm{d}i &= +10'' \qquad \mathrm{d}i' = +13.05\\
\mathrm{d}e &= +0.0000100
\end{aligned}
$$

These values of the increments were substituted in the original equations of condition. The annexed table gives a comparison of the results thus secured.

1898	$\cos\delta\,\mathrm{d}\alpha$		$\mathrm{d}\delta$	
	Elements	Equations	Elements	Equations
Mar. 25.5	− 2″.61	− 2″.56	+2″.81	+2″.88
April 14.0	− 3.12	− 3.03	+5.44	+5.49
May 15.0	+ 1.86	+ 1.99	+8.57	+8.56
Juni 16.0	+ 7.08	+ 7.09	+6.98	+6.92
July 18.5	+ 9.44	+ 9.44	+4.72	+4.67
Aug. 20.5	+10.82	+10.77	+3.38	+3.43
Sept. 16.5	+12.08	+11.96	+3.12	+3.04
Oct. 15.5	+13.56	+13.57	+3.97	+3.90
Nov. 11.5	+14.48	+14.58	+6.21	+6.12

The normal equations resulting are as follows (natural numbers):

$[aa]$	$[ab]$	$[ac]$	$[ad]$	$[ae]$	$[af]$	$[an]$	$[as]$
+3.2350	+2.0191	−3.0738	+2.7349	−0.6983	−0.9051	+1.3758	+4.6876
	+2.7579	−2.9369	+1.8295	+0.5535	+0.8871	−0.1502	+4.9600
		+3.8760	−3.0974	+0.1877	−0.9114	−0.6537	−6.6095
			+3.3230	−0.8775	+0.1090	+0.9906	+5.0121
				+3.1769	+0.8158	−1.2810	+1.8771
					+4.7718	−0.7921	+3.9751
						+2.6990	+2.1884

From these, by the usual processes, the following elimination equations were derived:

Elimination equations (coefficients logarithmic).

$$
\begin{aligned}
[0.50987]\,x + [0.30516]\,y + [0.48768_n]\,z + [0.43694]\,t + [9.84404_n]\,u + [9.95670_n]\,w &= [0.13856]\\
[0.17542]\,y + [0.00792_n]\,z + [9.08824]\,t + [9.99535]\,u + [0.01620]\,w &= [0.00385_n]\\
[9.41972]\,z + [9.61853_n]\,t + [9.29433]\,u + [9.89434_n]\,w &= [8.51175_n]\\
[9.53684]\,t + [8.75450_n]\,u + [9.68469_n]\,w &= [9.15020_n]\\
[0.34551]\,u + [9.22742]\,w &= [9.50044_n]\\
[8.89916]\,w &= [9.47644]
\end{aligned}
$$

Owing to the uncertainty of de as derived from the solution there was a lack of accuracy in the comparison of the values of $[nn6]$ and $[pvv]$. Accordingly the values of the unknowns were found anew in terms of de.

This procedure gives:

$$
\begin{aligned}
u &= [9.15493_n] + [8.88191_n]\,w\\
t &= [9.63762_n] + [0.14395]\,w\\
z &= [9.84678_n] + [0.71946]\,w\\
y &= [0.00927_n] + [0.40330]\,w\\
x &= [9.86414] + [0.39555]\,w
\end{aligned}
$$

The substitution of these values gives

$\log x = 0.97412$	$dT = +0^d.011825$	$\pm 0^d.001679$
$\log y = 0.89348$	$d\log q = +0.0000524$	± 0.0000093
$\log z = 1.24595$	$d\pi' = +1'\ 8''.52$	$\pm 11''.03$
$\log t = 0.64687$	$d\Omega' = +0\ 18.07$	$\pm\ 3.21$
$\log u = 9.61194_n$	$di' = -0\ 1.80$	$\pm\ 0.49$
$\log w = 0.54348$	$de = +0.0004639$	± 0.0000706

$[vv] = 30''.64 \qquad [pvv] = 449''.1 \qquad [nn6] = 450''.5$

The sum of the squares of the weighted residuals has thus been reduced from 4213″ to 450″.

As a final check on the accuracy of the calculation the residuals secured by direct comparison with places computed from the changed elements and by actual substitution in the equations of condition are given in the annexed table.

No.	$\cos\delta\, d\alpha$		$d\delta$	
	Elements	Equations	Elements	Equations
I	+0″.17	+0″.17	+0″.06	+0″.06
II	−0.07	−0.10	−0.02	+0.02
III	−0.14	−0.16	−0.36	−0.31
IV	+1.15	+1.15	−0.21	−0.17
V	+1.97	+2.01	+0.68	+0.68
VI	+0.01	+0.06	+1.92	+1.95
VII	−0.59	−0.51	−0.74	−0.66
VIII	−2.43	−2.40	+1.39	+1.54
IX	−3.06	−3.05	−1.59	−1.64

By means of the equations

$$
\begin{aligned}
\Delta\Omega &= \frac{\sin\Omega}{\sin\Omega'}\cos\sigma\,\Delta\Omega' - \frac{\sin\sigma}{\sin i}\,\Delta i'\\
\Delta i &= \sin\sigma\sin i'\,\Delta\Omega' + \cos\sigma\,\Delta i'\\
\Delta\sigma &= \frac{\sin\sigma}{\sin\Omega'}\cos\Omega\,\Delta\Omega' - \frac{\sin\sigma}{\sin i}\cos i'\,\Delta i'\\
\Delta\pi &= \Delta\Omega + \Delta\omega' - \Delta\sigma
\end{aligned}
$$

the increments of the elements referred to the ecliptic were derived.

$$
\begin{aligned}
d\Omega &= +15''.49\\
di &= -\ 8.77\\
d\omega &= +51.68
\end{aligned}
$$

Whence the following definitive elements:

Equinox of 1898.0.

$$
\begin{aligned}
T &= 1898\ \text{March}\ 17.130777\ \text{Gr. m. t.}\\
\omega &= 47^\circ\ 19'\ 11''.85\\
\Omega &= 262\ 26\ 19.06\\
i &= 72\ 31\ 47.01\\
\log q &= 0.0395112\\
e &= 0.9803852\\
\text{Period} &= 417.2 \pm 2.2\ \text{years.}
\end{aligned}
$$

In order to find whether the sum of the squares of the residuals could be reduced by varying the excentricity the following increments (in units of the seventh decimal place) were applied to de.

Increment	$[pvv]$	Increment	$[pvv]$
−400	1130″	+ 25	450″
−200	626	+ 50	466
− 50	466	+200	746
− 25	452	+400	1260
0	450		

The computed value of de was accordingly assumed as that which best satisfies the solution.

I hope, in a succeeding paper, to determine the original excentricity with which the comet entered the solar system.

In conclusion I desire to express my appreciation of the splendid series of measures made by Professor C. D. Perrine, the discoverer of the comet. In extent and in quality they leave nothing to be desired. For helpful suggestions and advice I would thank Professor Ormond Stone of the Leander Mc Cormick Observatory and Professor R. G. Aitken of Lick Observatory.

Leander Mc Cormick Observatory, 1902 Febr. 1st.

Heber D. Curtis.