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Definitive Orbit of Comet 1898 VI.

By *Heber D. Curtis* and *Laura Shearer Richardson*.

a) Discovery.

Comet 1898 VI was discovered by C. D. Perrine at Mt. Hamilton on June 14, 1898 in $3^h 29^m$ right ascension and $+58° 36'$ declination, and at this time had a diameter of about two minutes of arc. Making no deduction for observations in one component only, it was observed one hundred and twenty two times between the dates June 14 and August 11, 1898, in which period it had traversed a heliocentric arc of nearly 90°. Professor Perrine attempted an observation on August 16, but by this date the comet was too near the horizon and an observation impossible because of the dawn. During the latter part of the apparition period the comet was generally described as resembling a seventh or eighth magnitude star out of focus; owing to its faintness, no other physical details were noted, with the exception of a short, bushy tail, estimated by Perrine as 3′ or 4′ in length.

b) Provisional Elements.

Elements were computed by Berberich, Perrine and Aitken, and by Perrine (Astr. Journ. No. 444, p. 95, 1898). As this last orbit by Perrine covered nearly the entire range of observed positions, it was made the basis of the definitive solution.

These elements are:

$$
\begin{aligned}
T &= 1898 \text{ Aug. } 16.19978 \text{ Gr. M. T.} \\
\omega &= 205° 36' 24''.0 \\
\Omega &= 259 \ \ 6 \ \ 12.2 \quad 1898.0 \\
i &= 70 \ \ 1 \ \ 36.7 \\
\log q &= 9.796950
\end{aligned}
$$

c) Ephemeris.

From these elements the following ephemeris for Gr. M. T. was computed with seven-place logarithms at intervals of 12^h, except for the last ten days of the apparition period, when an interval of 24^h was used.

1898	α	δ	log Δ	Aberr.-T.
June 13.0	$3^h 16^m 44^s.91$	+58° 55′ 41″.4	0.2954	$16^m 24^s.1$
13.5	19 52.30	58 50 56.3	0.2942	
14.0	22 59.50	58 45 54.8	0.2930	
14.5	26 6.52	58 40 36.8	0.2919	
15.0	29 13.32	58 35 2.2	0.2907	16 13.6
15.5	32 19.85	58 29 11.0	0.2895	
16.0	35 26.04	58 23 3.1	0.2883	
16.5	3 38 31.86	+58 16 38.3	0.2872	

1898	α	δ	log Δ	Aberr.-T.
June 17.0	$3^h 41^m 37^s.28$	+58° 9′ 56″.7	0.2860	$16^m 3^s.1$
17.5	44 42.26	58 2 58.1	0.2848	
18.0	47 46.76	57 55 42.5	0.2836	
18.5	50 50.73	57 48 9.8	0.2825	
19.0	53 54.15	57 40 20.0	0.2813	15 52.7
19.5	56 56.99	57 32 13.1	0.2801	
20.0	3 59 59.19	57 23 49.0	0.2790	
20.5	4 3 0.73	57 15 7.5	0.2778	
21.0	6 1.58	57 6 8.6	0.2766	15 42.5
21.5	9 1.71	56 56 52.5	0.2755	
22.0	12 1.09	56 47 19.1	0.2743	
22.5	14 59.68	56 37 28.2	0.2731	
23.0	17 57.46	56 27 19.9	0.2720	15 32.4
23.5	20 54.39	56 16 54.2	0.2708	
24.0	23 50.46	56 6 10.9	0.2696	
24.5	26 45.64	55 55 10.1	0.2684	
25.0	29 39.91	55 43 51.9	0.2673	15 22.5
25.5	32 33.24	55 32 16.1	0.2661	
26.0	35 25.61	55 20 22.9	0.2649	
26.5	38 17.01	55 8 12.1	0.2638	
27.0	41 7.42	54 55 43.8	0.2626	15 12.6
27.5	43 56.82	54 42 58.0	0.2614	
28.0	46 45.19	54 29 54.6	0.2603	
28.5	49 32.52	54 16 33.6	0.2591	
29.0	52 18.80	54 2 55.1	0.2580	15 2.9
29.5	55 4.02	53 48 59.1	0.2568	
30.0	4 57 48.16	53 34 45.5	0.2556	
30.5	5 0 31.22	53 20 14.5	0.2545	
July 1.0	3 13.19	53 5 25.9	0.2533	14 53.3
1.5	5 54.06	52 50 19.9	0.2521	
2.0	8 33.82	52 34 56.4	0.2510	
2.5	11 12.46	52 19 15.3	0.2498	
3.0	13 49.99	52 3 16.8	0.2487	14 43.8
3.5	16 26.40	51 47 0.7	0.2475	
4.0	19 1.69	51 30 27.2	0.2464	
4.5	21 35.86	51 13 36.2	0.2452	
5.0	24 8.91	50 56 27.7	0.2440	14 34.4
5.5	26 40.83	50 39 1.7	0.2429	
6.0	29 11.64	50 21 18.2	0.2417	
6.5	31 41.34	50 3 17.3	0.2406	
7.0	34 9.92	49 44 59.0	0.2394	14 25.1
7.5	36 37.39	49 26 23.1	0.2383	
8.0	39 3.77	49 7 29.7	0.2371	
8.5	5 41 29.05	+48 48 18.8	0.2360	

1898	α	δ	log Δ	Aberr.-T.
July 9.0	$5^h 43^m 53^s.25$	+48° 28′ 50″.5	0.2348	$14^m 16^s.0$
9.5	46 16.37	48 9 4.7	0.2337	
10.0	48 38.42	47 49 1.3	0.2325	
10.5	50 59.41	47 28 40.3	0.2314	
11.0	53 19.35	47 8 1.8	0.2302	14 7.0
11.5	55 38.26	46 47 5.8	0.2291	
12.0	5 57 56.13	46 25 52.3	0.2279	
12.5	6 0 12.99	46 4 21.1	0.2268	
13.0	2 28.85	45 42 32.3	0.2257	13 58.2
13.5	4 43.72	45 20 25.9	0.2245	
14.0	6 57.61	44 58 1.9	0.2234	
14.5	9 10.54	44 35 20.2	0.2222	
15.0	11 22.53	44 12 20.7	0.2211	13 49.4
15.5	13 33.59	43 49 3.5	0.2200	
16.0	15 43.73	43 25 28.6	0.2188	
16.5	17 52.97	43 1 35.9	0.2177	
17.0	20 1.33	42 37 25.3	0.2166	13 40.8
17.5	22 8.82	42 12 56.9	0.2154	
18.0	24 15.47	41 48 10.6	0.2143	
18.5	26 21.28	41 23 6.4	0.2132	
19.0	28 26.29	40 57 44.1	0.2121	13 32.3
19.5	30 30.51	40 32 3.8	0.2109	
20.0	32 33.96	40 6 5.6	0.2098	
20.5	34 36.66	39 39 49.2	0.2087	
21.0	36 38.63	39 13 14.8	0.2076	13 24.0
21.5	38 39.89	38 46 22.2	0.2065	
22.0	40 40.47	38 19 11.5	0.2054	
22.5	42 40.39	37 51 42.5	0.2043	
23.0	44 39.67	37 23 55.1	0.2032	13 15.9
23.5	46 38.33	36 55 49.5	0.2021	
24.0	48 36.40	36 27 25.7	0.2010	
24.5	50 33.90	35 58 43.5	0.1999	
25.0	52 30.85	35 29 43.0	0.1988	13 7.9
25.5	54 27.28	35 0 24.1	0.1977	
26.0	56 23.22	34 30 46.8	0.1966	
26.5	6 58 18.69	34 0 51.1	0.1955	
27.0	7 0 13.72	33 30 37.1	0.1945	13 0.1
27.5	2 8.34	33 0 4.7	0.1934	
28.0	4 2.58	32 29 13.9	0.1923	
28.5	5 56.45	31 58 4.8	0.1913	
29.0	7 49.99	31 26 37.3	0.1902	12 52.4
29.5	9 43.22	30 54 51.6	0.1892	
30.0	11 36.18	30 22 47.6	0.1881	
30.5	13 28.88	29 50 25.4	0.1871	
31.0	15 21.36	29 17 45.2	0.1860	12 45.1
31.5	17 13.65	28 44 47.0	0.1850	
Aug. 1.0	19 5.78	28 11 30.7	0.1841	
1.5	20 57.78	27 37 56.5	0.1830	
2.0	22 49.67	27 4 4.7	0.1820	12 38.1
2.5	24 41.49	26 29 55.3	0.1811	
3.0	26 33.27	25 55 28.4	0.1800	
3.5	7 28 25.05	+25 20 44.0	0.1792	12 33.1
4.5	7 32 8.61	+24 10 24.5	0.1771	12 29.4
5.5	35 52.50	22 58 57.9	0.1751	
6.5	39 36.93	21 46 26.3	0.1733	12 23.0
7.5	7 43 22.14	+20 32 51.9	0.1715	
Aug. 8.5	$7^h 47^m 8^s.37$	+19° 18′ 17″.2	0.1698	$12^m 17^s.0$
9.5	50 55.83	18 2 45.3	0.1681	
10.5	54 44.76	16 46 19.2	0.1664	12 11.3
11.5	7 58 35.36	15 29 2.6	0.1649	
12.5	8 2 27.83	14 10 59.5	0.1634	12 6.2
13.5	8 6 22.37	+12 52 13.8	0.1620	

d) Star Places.

The adopted positions of the comparison stars are given in the accompanying table, together with the authorities upon which the positions are based. Professor R. H. Tucker kindly determined the positions of stars no. 7 and no. 37 with the Lick Observatory Meridian Circle.

*	α 1898.0	δ 1898.0	Authority
1	$3^h 29^m 26^s.51$	+58° 38′ 36″.2	Micr. comp. with * 2
2	3 31 28.32	+58 40 46.1	AG Hels 3120
3	3 33 47.99	+58 25 8.4	» 3151
4	3 37 37.68	+57 59 38.2	» 3174
5	3 38 3.96	+58 10 24.9	Micr. comp. with * 3
6	3 40 44.46	+58 4 2.9	Micr. comp. with * 4
7	3 43 22.64	+58 6 12.5	BD +57°750; Tucker, L. O. M. C. 1900
8	3 45 13.83	+58 8 58.1	Micr. comp. with * 12
9	3 45 26.02	+57 40 18.7	1/9 (4 Par₈ 4508 + 5 AG Hels 3254)
10	3 46 46.74	+57 54 29.0	AG Hels 3264
11	3 48 29.94	+58 10 33.4	» 3282
12	3 50 5.46	+58 19 28.5	» 3289
13	3 51 0.10	+57 41 37.9	» 3293
14	3 55 10.27	+57 25 42.6	» 3336
15	3 57 13.02	+57 24 53.6	Micr. comp. with * 14
16	4 6 39.62	+57 11 59.4	AG Hels 3434
17	4 8 32.84	+56 59 7.1	» 3447
18	4 9 0.16	+56 55 25.4	» 3452
19	4 13 33.59	+56 15 40.3	» 3496
20	4 16 35.90	+56 38 10.7	» 3527
21	4 20 7.15	+56 8 33.1	» 3552
22	4 20 14.92	+56 11 15.4	» 3553
23	4 22 5.58	+56 14 1.0	» 3574
24	4 29 29.45	+55 54 30.5	» 3649
25	4 31 36.91	+55 32 9.5	» 3665
26	4 32 30.02	+55 39 47.1	» 3677
27	4 34 40.86	+55 29 35.5	» 3696
28	4 35 42.97	+55 20 39.1	» 3708
29	4 39 52.78	+54 37 52.9	AG Cbr M. 1953
30	4 40 15.75	+54 38 1.2	» 1957
31	4 41 24.03	+55 0 6.9	AG Hels 3762
32	4 43 39.19	+54 43 41.4	AG Cbr M. 1981
33	4 44 43.14	+54 19 6.2	» 1994
34	4 45 48.42	+54 32 12.1	Micr. comp. with * 29 and * 30
35	4 50 54.10	+53 44 39.8	AG Cbr M. 2016
36	4 52 33.51	+54 25 47.0	» 2027

*	α 1898.0	δ 1898.0	Authority
37	$4^h 52^m 40^s.37$	$+54° 22' 30''.6$	BD $+54°847$; Tucker, L. O. M. C. 1900
38	4 53 35.35	+53 45 3.6	Micr. comp. with * 40
39	4 54 9.50	+54 13 25.3	AG Cbr M. 2037
40	4 54 34.94	+53 36 30.9	» 2041
41	4 54 35.08	+53 45 1.2	Micr. comp. with * 35
42	5 3 43.50	+53 19 26.1	AG Cbr M. 2105
43	5 10 37.37	+52 43 8.8	» 2140
44	5 13 54.20	+52 6 34.7	» 2153
45	5 43 28.08	+48 34 58.8	AG Bo 4766
46	5 48 40.14	+47 41 53.8	» 4830
47	5 58 35.17	+46 8 10.2	» 4978
48	6 0 42.59	+46 28 5.5	» 5007
49	6 1 10.67	+45 39 22.9	» 5013
50	6 1 22.30	+46 9 58.2	» 5015
51	6 1 23.19	+45 50 55.7	» 5016
52	6 5 52.29	+45 4 35.3	» 5084
53	6 7 12.13	+44 36 40.9	» 5096
54	6 14 36.26	+44 6 16.5	» 5184
55	6 14 42.22	+42 53 22.6	» 5185
56	6 15 5.26	+43 34 10.0	» 5191
57	6 15 35.79	+42 57 5.1	» 5195
58	6 15 48.98	+43 44 46.6	» 5196
59	6 17 24.05	+43 36 5.5	» 5219
60	6 17 41.74	+42 35 56.9	» 5225
61	6 19 6.29	+42 0 57.6	» 5245
62	6 22 55.46	+41 54 41.2	» 5278
63	6 26 27.32	+40 56 15.8	» 5335
64	6 27 20.34	+41 8 13.9	» 5342
65	6 28 24.23	+41 4 26.1	Micr. comp. with * 63
66	6 31 35.46	+39 28 50.3	51 Aurigae, B. J.
67	6 31 43.09	+39 59 22.8	AG Bo 5391
68	6 32 41.62	+40 3 41.0	» 5405
69	6 36 37.88	+39 16 36.0	AG Lu Z. 370, 500
70	6 38 28.08	+38 29 13.4	$^1/_4$(2 AG Lu Z. 497, 506 + Par_8 8097 + Kam_1 1159)
71	6 40 18.42	+38 21 15.1	AG Lu Z. 501, 506
72	6 40 23.57	+38 38 43.2	$^1/_6$ (5 AG Lu Z. 123, 135, 685 + Kam_1 1168)

*	α 1898.0	δ 1898.0	Authority
73	$6^h 43^m 22^s.23$	$+36° 31' 5''.1$	AG Lu Z. 153, 157
74	6 45 26.61	+37 31 37.5	» 500, 638
75	6 52 59.96	+35 37 12.2	» 112, 131
76	6 53 28.31	+35 35 31.7	» 153, 157
77	6 56 49.43	+34 24 9.1	AG Lei Z. 14, 279
78	6 58 16.45	+34 27 14.3	» 164, 279
79	7 1 42.39	+33 25 40.1	» 161, 401
80	7 4 13.32	+32 23 26.6	$^1/_{11}$(5 Par_8 8745 + 5Q 2967 + W_2 6^h1897)
81	7 9 6.24	+31 32 42.6	AG Lei Z. 147, 254
82	7 11 17.14	+30 33 39.9	» 272, 350
83	7 12 12.18	+30 22 7.9	Micr. comp. with * 85
84	7 12 25.97	+29 17 7.1	AG Cbr E. 3827
85	7 14 6.61	+30 26 17.5	AG Lei Z. 272, 350
86	7 14 33.32	+29 16 44.4	Micr. comp. with * 84
87	7 15 3.30	+29 9 57.5	AG Cbr E. 3913
88	7 23 14.08	+27 8 14.8	» 3986
89	7 24 38.37	+25 56 48.9	» 4002
90	7 26 20.36	+25 55 37.6	Micr. comp. with * 89
91	7 27 5.57	+25 56 50.9	AG Cbr E. 4035
92	7 33 31.94	+23 35 28.8	Micr. comp. with * 96
93	7 34 20.09	+23 27 45.9	AG Berl B 3059
94	7 34 38.02	+23 28 52.3	» 3060
95	7 35 30.60	+22 21 16.9	» 3071
96	7 35 37.08	+23 45 6.5	» 3072
97	7 36 38.89	+22 27 52.0	» 3079
98	7 38 1.70	+22 20 3.8	Micr. comp. with * 95
99	7 41 46.30	+21 11 11.9	AG Berl B 3120
100	7 44 41.08	+19 59 31.4	$^1/_2$(AG Berl B 3142 + AG Berl A 3054)
101	7 48 15.60	+18 48 11.8	AG Berl A 3087
102	7 56 49.52	+16 11 55.5	» 3172

e) Comparison with Ephemeris.

Before comparing the observations with the ephemeris the parallax factors were recomputed with uniform constants, using 8''.80 for the sun's parallax; the reductions to apparent place were also recomputed.

Arcetri. *A. Abetti.*

284 mm equatorial, power 124. A. N. 3554.

1898 Gr. M. T.	*	Parallax α	Parallax δ	Geocentric place α	Geocentric place δ	O — C Δα cos δ	O — C Δδ
June 18.47737	13	$-0^s.25$	$+4''.0$	$3^h 50^m 44^s.82$	$+57° 48' 23''.4$	$+1^s.28$	$-7''.3$
20.48634	16	−0.26	+4.0	4 2 58.06	+57 15 8.5	+1.23	−13.4
21.46868	17	−0.22	+4.0	4 8 52.61	+56 57 24.5	+1.18	−3.3
21.46868	18	−0.22	+4.0	4 8 52.86	+56 57 24.1	+1.31	−3.7
25.49865	25	−0.26	+4.0	4 32 34.21	+55 32 14.7	+0.82	−3.3
25.49865	27	−0.26	+4.0	4 32 34.35	+55 32 8.9	+0.89	−9.1
28.46138	37	−0.19	+4.5	4 49 20.83	+54 17 25.4	+0.70	−10.7
28.46138	36	−0.19	+4.5	4 49 21.15	+54 17 28.0	+0.89	−8.1
30.55165	42	−0.33	+3.5	5 0 49.39	+53 18 38.8	+0.83	−4.7
July 15.58861	58	−0.33	+3.7	6 13 56.96	+43 44 49.0	+0.17	−5.1
15.58861	59	−0.33	+3.7	6 13 57.19	+43 44 46.3	+0.33	−7.8

1898 Gr. M. T.	*	Parallax α	Parallax δ	Geocentric place α	Geocentric place δ	O — C Δα cos δ	O — C Δδ
July 16.58653	55	$-0^s.32$	$+3''.8$	$6^h 18^m 15^s.51$	$+42^\circ 57' 33''.8$	$+0^s.20$	$+7''.6$
16.58653	57	−0.31	+3.9	6 18 15.90	+42 57 30.4	+0.48	+4.2
17.58507	61	−0.32	+3.8	6 22 31.51	+42 8 49.5	+0.80	+4.2
18.59468	64	−0.32	+3.7	6 26 45.32	+41 18 16.1	+0.23	−3.4
20.59426	66	−0.32	+3.7	6 34 59.63	+39 34 59.3	−0.05	+9.3
21.58422	70	−0.31	+4.0	6 39 0.74	+38 41 47.2	+0.38	−1.6
21.58422	72	−0.31	+4.0	6 39 0.38	+38 41 43.8	+0.10	−5.0

Giug. 18, 20. Splendidissimo. Pallidissimo albore, senza nucleo marcato, per cui si punta male. — Giug. 21. Splendido. Estremamente debole. — Giug. 25. Splendidissimo. Macchia tonda senza traccia di coda, del diametro di circa 1′, pareggia una stella di 9^m sfuocata. — Giug. 28. Chiaro di luna in P. Q. La cometa è assai debole. — Giug. 30. Sereno splendido. Si osservò dopo il tramonto della luna, perciò la cometa fu abbastanza bene visibile. — Lugl. 15. Splendidissimo, ma la cometa è molto debole in causa dell'aurora. — Lugl. 16. Splendidissimo. La cometa pareggia una stella di 9^m sfuocata. — Lugl. 17. Idem. — Lugl. 18. Sereno fosco, brutto cielo e così brutta pure la cometa. — Lugl. 20. Cielo ragnato. — Lugl. 21. Splendidissimo. La cometa pareggia una stella di 9^m sfuocata.

Bamberg. *E. Hartwig.*

Heliometer. A. N. 3500.

1898 Gr. M. T.	*	Parallax α	Parallax δ	Geocentric place α	Geocentric place δ	O — C Δα cos δ	O — C Δδ
June 17.52311	10	$-0^s.29$	$+3''.4$	$3^h 44^m 53^s.94$	$+58^\circ 2' 28''.7$	$+1^s.66$	$-9''.7$

Durchmesser 2′; rund, ohne Kern. Helligkeit 9^m. Wegen Wolken nur eine Vergleichung in Abstand und Richtung.

Besançon. *P. Chofardet.*

0.33 m equatorial coudé. A. N. 3509.

1898 Gr. M. T.	*	Parallax α	Parallax δ	Geocentric place α	Geocentric place δ	O — C Δα cos δ	O — C Δδ
June 17.52242	10	$-0^s.29$	$+3''.5$	$3^h 44^m 51^s.11$	$+58^\circ 2' 37''.2$	$+0^s.30$	$-1''.8$
18.48969	9	−0.23	+3.9	3 50 47.41	+57 48 21.0	+0.24	+1.7
20.50223	16	−0.24	+3.9	4 3 2.62	+57 15 2.9	+0.58	−2.2

Corrected data communicated by observer in letter.

Göttingen. *W. Schur.*

Heliometer with cross-bar micrometer. A. N. 3515.

1898 Gr. M. T.	*	Parallax α	Parallax δ	Geocentric place α	Geocentric place δ	O — C Δα cos δ	O — C Δδ
July 21.52341	72	$-0^s.19$	$+4''.9$	$6^h 38^m 44^s.16$	$+38^\circ 45' 12''.1$	$-1^s.08$	$+5''.8$

Komet trotz des niedrigen Standes in 83° Z. D. und der Dämmerung recht hell, kreisförmig, und die innere Übereinstimmung der vier Beobachtungen ganz unerwartet gut.

Hamburg. *R. Schorr.*

0.257 m equatorial, power 127. A. N. 3560.

1898 Gr. M. T.	*	Parallax α	Parallax δ	Geocentric place α	Geocentric place δ	O — C Δα cos δ	O — C Δδ
June 23.46926	22	$-0^s.17$	$+4''.1$	$4^h 20^m 43^s.75$	$+56^\circ 17' 19''.8$	$+0^s.12$	$-13''.4$

Bei schlechter Luft und Wolken sehr schwierig zu beobachten. Kleine neblige Masse mit schwacher Verdichtung $11^m.5$. — Juni 26. Bei guter Luft Komet nicht wahrnehmbar.

Kremsmünster. *F. Schwab.* A. N. 3529.

1898 Gr. M. T.	•	Parallax α	Parallax δ	Geocentric place α	Geocentric place δ	O — C Δα cos δ	O — C Δδ
July 16.53572	55	$-0^s.27$	$+4''.2$	$6^h 18^m 2^s.40$	$+42° 59' 59''.3$	$+0^s.17$	$+6''.4$
16.54981	57	−0.27	+4.2	6 18 5.85	+42 59 7.8	+0.04	−4.4

Liverpool. *W. E. Plummer.*
Cross-wire micrometer. M. N. 59.102.

1898 Gr. M. T.	•	Parallax α	Parallax δ	Geocentric place α	Geocentric place δ	O — C Δα cos δ	O — C Δδ
June 17.52953	4	$-0^s.23$	$+3''.7$	$3^h 44^m 54^s.62$	$+58° 2' 29''.4$	$+0^s.77$	$-3''.5$

Mt. Hamilton. *C. D. Perrine.*
12-inch equatorial (36-inch equatorial on June 25, July 2 and 18). A. N. 3500 and A. J. 19.54, 20.99.

1898 Gr. M. T.	•	Parallax α	Parallax δ	Geocentric place α	Geocentric place δ	O — C Δα cos δ	O — C Δδ
June 14.96275	1	$-0^s.45$	$+1''.9$	$3^h 29^m 0^s.55$	$+58° 35' 26''.9$	$+0^s.59$	$-0''.8$
15.91843	3	−0.41	+2.8	3 34 57.29	+58 24 4.8	+0.84	+0.5
16.92648	6	−0.43	+2.7	3 41 11.47	+58 10 51.6	+0.75	−5.2
17.91230	10	−0.40	+2.8	3 47 15.13	+57 56 55.6	+0.37	−4.5
19.92014	14	−0.40	+2.9	3 59 31.13	+57 25 4.9	+0.54	−5.8
20.89840	16	−0.37	+3.4	4 5 25.92	+57 7 54.7	+0.56	−4.8
22.91808	20	−0.39	+3.1	4 17 28.48	+56 28 56.5	+0.05	−4.3
23.92501	21	−0.40	+3.1	4 23 24.84	+56 7 44.4	+0.40	−4.1
24.91197	24	−0.38	+3.3	4 29 9.91	+55 45 50.4	+0.34	−2.2
24.94632	26	−0.42	+2.7	4 29 22.06	+55 45 0.9	+0.46	−4.6
25.91983	28	−0.38	+3.2	4 34 58.78	+55 22 15.8	+0.43	−2.7
26.91749	31	−0.38	+3.3	4 40 40.07	+54 57 43.0	+0.40	−5.5
27.91585	34	−0.37	+3.4	4 46 17.27	+54 32 5.1	+0.20	−2.5
28.93003	39	−0.39	+3.2	4 51 55.99	+54 4 45.6	+0.23	−5.0
July 1.92905	43	−0.37	+3.4	5 8 11.33	+52 37 5.6	+0.07	−2.9
2.94287	44	−0.39	+3.2	5 13 32.12	+52 5 3.1	+0.04	−4.1
8.93622	45	−0.36	+3.6	5 43 34.52	+48 31 24.0	−0.26	+3.5
9.98417	46	−0.40	+3.0	5 48 34.20	+47 49 43.0	+0.17	+3.3
11.96394	48	−0.38	+3.2	5 57 46.14	+46 27 22.7	−0.06	−2.0
12.94980	51	−0.36	+3.5	6 2 15.03	+45 44 42.1	−0.15	−2.4
12.97024	49	−0.38	+3.1	6 2 20.72	+45 43 50.8	−0.05	+0.1
13.96773	52	−0.37	+3.2	6 6 48.91	+44 59 27.4	−0.06	−1.8
14.97705	54	−0.38	+3.1	6 11 16.34	+44 13 24.1	−0.11	−0.3
15.96050	56	−0.36	+3.4	6 15 33.12	+43 27 22.4	−0.26	+1.4
16.96829	60	−0.37	+3.3	6 19 53.01	+42 38 59.4	−0.15	+1.6
17.96933	62	−0.36	+3.4	6 24 7.48	+41 49 41.8	−0.18	−0.4
18.97501	65	−0.36	+3.3	6 26 19.55	+40 59 1.8	−0.39	+1.2
18.98620	63	—	+3.1	—	+40 58 30.0	—	+3.7
18.99468	63	−0.37	—	6 28 24.86	—	−0.08	—
19.98146	67	−0.36	+3.2	6 32 29.20	+40 7 3.0	−0.15	−0.7
19.99170	68	−0.37	+3.0	6 32 31.52	+40 6 31.4	−0.31	−0.2
20.97376	69	−0.36	+3.4	6 36 31.87	+39 14 40.2	−0.29	+1.3
21.96967	71	−0.35	+3.5	6 40 32.86	+38 20 52.2	−0.25	+1.3
22.97873	74	−0.35	+3.4	6 44 34.38	+37 25 6.1	−0.18	−0.3
23.98169	73	—	+3.3	—	+36 28 30.6	—	+2.2
23.99194	73	−0.36	—	6 48 34.13	—	−0.30	—
24.97872	76	−0.35	+3.4	6 52 25.60	+35 30 58.8	−0.23	+1.3
24.99031	75	−0.35	+3.3	6 52 27.92	+35 30 17.0	−0.55	+0.1
25.98490	78	−0.35	+3.4	6 56 19.38	+34 31 41.8	−0.29	+1.0

1898 Gr. M. T.	*	Parallax α	Parallax δ	Geocentric place α	Geocentric place δ	O − C Δα cos δ	O − C Δδ
July 25.99634	77	—	+3″.2	—	+34° 31′ 3″.5	—	+3″.6
25.99903	77	−0s.36	—	6h 56m 22s.66	—	−0s.27	—
26.98878	79	−0.35	+3.4	7 0 10.84	+33 31 20.1	−0.25	+2.1
27.98764	80	−0.35	+3.4	7 3 59.37	+32 30 3.0	−0.33	+3.1
28.99039	81	−0.34	+3.4	7 7 47.43	+31 27 13.5	−0.32	−0.3
29.98664	82	−0.34	+3.5	7 11 32.67	+30 23 40.7	−0.42	+1.5
29.99598	83	−0.35	+3.4	7 11 34.92	+30 23 4.3	−0.30	+1.1
30.98584	87	−0.34	+3.5	7 15 18.10	+29 18 45.2	−0.07	+4.2
30.99625	86	−0.34	+3.4	7 15 20.21	+29 18 2.3	−0.27	+2.3
Aug. 2.00473	88	−0.34	+3.3	7 22 50.33	+27 3 42.8	−0.36	−2.6
2.99657	90	−0.34	+3.5	7 26 32.43	+25 55 41.4	−0.06	−1.3
3.00357	91	−0.34	+3.4	7 26 33.96	+25 55 12.6	−0.10	−1.0
4.99744	93	−0.34	—	7 33 59.73	—	−0.17	—
4.99744	94	−0.34	+3.5	7 33 59.77	+23 35 0.9	−0.14	+0.5
5.00271	93	—	+3.5	—	+23 34 38.3	—	+0.5
5.00604	92	—	+3.4	—	+23 34 25.1	—	+1.6
5.00983	92	−0.34	—	7 34 2.46	—	−0.22	—
6.00074	97	−0.34	+3.5	7 37 44.56	+22 22 48.1	−0.22	+1.3
6.00731	98	—	+3.5	—	+22 22 15.8	—	−2.5
6.01040	98	−0.34	—	7 37 46.70	—	−0.25	—
6.99774	99	−0.33	+3.6	7 41 28.76	+21 9 56.5	−0.15	−0.3
7.99859	100	−0.33	+3.6	7 45 14.75	+19 55 49.8	−0.04	+1.5
8.99873	101	−0.33	+3.6	7 49 1.66	+18 40 44.5	+0.02	+0.5
11.00642	102	−0.33	+3.6	7 56 41.07	+16 7 13.6	−0.24	−3.6
11.01259	102	—	+3.6	—	+16 6 45.2	—	−3.4

June 15. Comet 1′.5 in diameter, $10^m.5$. Central condensation, but no nucleus. — June 19. No well-defined nucleus, otherwise nearly as bright as Comet 1898 I. — June 20. Comet same brightness as Comet 1898 I. Has a nucleus which is fairly sharp. — June 23. Comet is brighter. Nucleus of 13^m. — June 24. Comet is almost twice as bright as Comet 1898 I; about $9^m.5$. — June 25. (36-inch telescope). Comet brightens gradually to a central condensation, but there is no nucleus proper. — June 28. Nucleus much sharper than heretofore; $10^m.5$ or 11^m. — July 8. Comet easy; fully as bright as $9^m.0$. Nucleus seems sharp. — July 11. Comet bright and has a nucleus of $11–12^m$. — July 12. Wind shakes telescope some. Comet bright and easy; $8^m.5$. Nucleus $10^m.5$ or 11^m. — July 14. Nucleus $11–12^m$. — July 15. Nucleus quite bright, 10^m or $10^m.5$. Comet $8^m.5$ or 9^m. — July 16. Comet $8^m.5$. — July 17. Comet $8^m.5$; has a sharp nucleus of 10^m. Seeing good. Short tail in position angle 305°. — July 19. Comet 8^m. Can see to bisect it with dark wires. Comet still visible at $16^h 12^m$ P. S. T. — July 20. Comet has a sharp nucleus of 11^m. — July 21. Sharp nucleus distinctly visible. Comet is brighter than the comparison star of $8^m.5$. — July 24. Comet 8^m; nucleus $10^m–10^m.5$. Short bushy tail north preceding. — July 25. Comet 8^m or $8^m.5$. Nucleus of $9^m.5$ or 10^m. Seeing good. — July 26. Observation interrupted by clouds. — July 27. Comet is full $8^m.0$; if anything it is brighter. — July 28. Comet brighter than 8^m, probably $7^m.5$. Has a nucleus of $9^m.5$. — July 29. Comet $7^m.5$; nucleus $9^m.5$. Tail 3′ or 4′ long, north preceding. — July 30. Comet fully three times as bright as the $8^m.3$ comparison star. — Aug. 4. Comet more easily seen at last measures than the $9^m.3$ comparison star. Nucleus $9^m.0$. — Aug. 7. Nucleus sharp and nearly as bright as $9^m.1$ comparison star. Seeing good. — Aug. 11. All measures made with dark wires. Clouds interfered. — Aug. 16. Comet looked for, but its place was too low down in the dawn.

Nicolajew. *I. Kortazzi.*

9-inch refractor. A. N. 3533.

1898 Gr. M. T.	*	Parallax α	Parallax δ	Geocentric place α	Geocentric place δ	O − C Δα cos δ	O − C Δδ
June 27.45690	32	−0s.27	+4″.2	4h 43m 41s.84	+54° 44′ 6″.2	−0s.24	+1″.5
28.44890	33	−0.25	+4.1	4 49 15.59	+54 17 51.3	+0.07	−5.0
29.46112	38	−0.27	+4.0	4 54 51.65	+53 50 3.6	+0.25	−1.1

June 27. A ce moment la comète se trouvait à la distance minimale de l'étoile; les angles de position et les distances furent mesurés avant et après ce moment; la position donnée est calculée d'après la méthode des moindres carrés.

Padua. *A. Antoniazzi.*
187 mm equatorial. A. N. 3536.

1898 Gr. M. T.	•	Parallax α	Parallax δ	Geocentric place α	Geocentric place δ	O − C Δα cos δ	O − C Δδ
June 28.54590	39	$-0^s.33$	+3″.5	$4^h 49^m 47^s.91$	+54° 15′ 15″.2	$+0^s.05$	−4″.0
29.55408	41	−0.34	+3.5	4 56 22.30	+53 47 24.5	+0.28	−3.1
July 14.55289	53	−0.28	+4.2	6 9 23.96	+44 32 53.0	−0.41	−2.1
15.55580	58	−0.29	+4.2	6 13 47.81	+43 46 24.1	−0.25	−2.4

La cometa è assai splendente, con nucleo distinto; si osserva con facilità.

Palermo. *T. Zona.* A. N. 3505.

1898 Gr. M. T.	•	Parallax α	Parallax δ	Geocentric place α	Geocentric place δ	O − C Δα cos δ	O − C Δδ
June 17.52368	7	$-0^s.38$	+3″.2	$3^h 44^m 51^s.16$	+58° 2′ 16″.6	$+0^s.08$	−21″.3
17.53900	7	−0.38	+3.2	3 44 57.53	+58 1 50.3	+0.45	−34.4

Paris. *G. Fayet* and *G. Bigourdan.*
0.305 m equatorial. Bull. Astr. **16**.170, C. R. **126**.1770.

1898 Gr. M. T.	•	Parallax α	Parallax δ	Geocentric place α	Geocentric place δ	O − C Δα cos δ	O − C Δδ
June 16.53106	5	$-0^s.28$	+3″.5	$3^h 38^m 44^s.82$	+58° 16′ 3″.4	$+0^s.75$	−10″.5
17.50988	8	−0.24	+3.8	3 44 46.89	+58 2 45.3	+0.52	− 4.4
17.53030	8	−0.28	+3.6	3 44 54.04	+58 2 25.7	+0.31	− 6.5
18.46968	13	−0.16	+4.2	3 50 40.07	+57 48 32.8	+0.25	− 5.0
18.52108	13	−0.26	+3.7	3 50 59.13	+57 47 45.7	+0.35	− 4.6
19.51318	15	−0.24	+3.8	3 57 2.71	+57 31 58.9	+0.49	− 1.1
21.54982	18	−0.30	+3.5	4 9 20.40	+56 55 48.1	+0.43	− 8.1

The first measure of June 17 and that of June 19 were made by M. Bigourdan; those on the other dates by M. Fayet. — Juin 16. La comète est une nébulosité diffuse, de 13^e grandeur, sans condensation, ayant environ 50″ d'étendue. Au commencement les mesures ont été un peu influencées par la présence de plusieurs petites étoiles voisines. — Juin 17. La comète est une tache nébuleuse, très diffuse, arrondie, de 1′ à 1′.5 de diamètre, dont l'éclat est comparable à celui d'une nébuleuse de la classe II. La partie centrale, qui est diffuse, assez granuleuse, ressort faiblement. — Juin 19. Comète très diffuse, très faible (gr. $13^m.2$ environ). Mesures assez incertaines.

Philadelphia. *H. Evans.* Astr. Journ. **19**.67.

1898 Gr. M. T.	•	Parallax α	Parallax δ	Geocentric place α	Geocentric place δ	O − C Δα cos δ	O − C Δδ
June 22.77824	20	$-0^s.36$	+3″.3	$4^h 16^m 38^s.24$	+56° 31′ 44″.9	$-0^s.26$	−7″.0
23.78577	23	−0.36	+3.2	4 22 35.77	+56 10 44.0	+0.36	−4.7
24.78691	24	−0.37	+3.3	4 28 25.34	+55 48 37.9	−0.23	−6.1

Strassburg. *H. Kobold.*
18-inch refractor. A. N. 3500, 3505 und 3552.

1898 Gr.-M. T.	•	Parallax α	Parallax δ	Geocentric place α	Geocentric place δ	O − C Δα cos δ	O − C Δδ
June 17.47883	4	$-0^s.21$	+3″.9	$3^h 44^m 35^s.81$	+58° 3′ 12″.1	$+0^s.71$	−4″.0
17.47883	11	−0.21	+3.9	3 44 36.10	+58 3 13.2	+0.88	−2.9
20.41544	16	−0.06	+4.4	4 2 31.34	+57 16 30.1	+0.68	−6.8
23.45609	23	−0.15	+4.4	4 20 39.69	+56 17 43.3	+0.45	−6.5
23.45625	19	−0.15	+4.4	4 20 39.53	+56 17 44.5	+0.33	−5.1
July 12.50039	50	−0.18	+4.8	6 0 13.31	+46 4 19.5	+0.15	−0.6

1898 Gr. M. T.	•	Parallax α	Parallax δ	Geocentric place α	Geocentric place δ	O − C Δα cos δ	O − C Δδ
July 12.50039	47	$-0^s.18$	$+4''.8$	$6^h\ 0^m 13^s.42$	$+46°\ 4'\ 17''.4$	$+0^s.22$	$-2''.7$
15.50631	58	−0.18	+4.9	6 13 35.14	+43 48 45.3	−0.07	−0.4
16.53878	57	−0.23	+4.6	6 18 3.12	+42 59 42.7	+0.12	−1.3

Juli 12. Komet ein heller runder Nebel von 1′ Ausdehnung mit starker zentraler Verdichtung. Wegen geringer Höhe und schlechter Luft nicht gut zu beobachten. — Juli 16. Beobachtung durch Wolken, in welchen der Komet zuletzt ganz verschwindet.

Toulouse. *F. Rossard.*

0.25 m equatorial. C. R. **126**.1767.

1898 Gr. M. T.	•	Parallax α	Parallax δ	Geocentric place α	Geocentric place δ	O − C Δα cos δ	O − C Δδ
June 18.47149	13	$-0^s.17$	$+4''.3$	$3^h 50^m 42^s.57$	$+57° 48' 30''.0$	$+1^s.23$	$-6''.1$

Vienna. *J. Bidschof.*

0.38 m equatorial coudé. Ann. d. k. k. Sternwarte zu Wien, Bd. XIV p.83.

1898 Gr. M. T.	•	Parallax α	Parallax δ	Geocentric place α	Geocentric place δ	O − C Δα cos δ	O − C Δδ
June 17.49978	7	$-0^s.30$	$+3''.3$	$3^h 44^m 43^s.77$	$+58°\ 2' 45''.5$	$+0^s.84$	$-12''.8$

Washington. *E. Frisby.*

12-inch equatorial. Astr. Journ. **19**.63.

1898 Gr. M. T.	•	Parallax α	Parallax δ	Geocentric place α	Geocentric place δ	O − C Δα cos δ	O − C Δδ
June 20.75691	16	$-0^s.33$	$+3''.6$	$4^h\ 4^m 33^s.62$	$+57° 10' 25''.0$	$-0^s.06$	$-7''.8$

f) Tabulation of observations.

1898	Place	*	$\Delta\alpha \cos\delta$	$\Delta\delta$
June 14.963	Mt. Hamilton	1	$+0^s.59$	$-0''.8$
15.918	»	3	+0.84	+ 0.5
16.531	Paris	5	+0.75	−10.5
16.926	Mt. Hamilton	6	+0.75	− 5.2
17.479	Strassburg	4	+0.71	− 4.0
17.479	»	11	+0.88	− 2.9
17.500	Vienna	7	+0.84	−12.8
17.510	Paris	8	+0.52	− 4.4
17.522	Besançon	10	+0.30	− 1.8
17.523	Bamberg	10	[+1.66]	[− 9.7]
17.524	Palermo	7	+0.08	[−21.3]
17.530	Liverpool	4	+0.77	− 3.5
17.530	Paris	8	+0.31	− 6.5
17.539	Palermo	7	+0.45	[−34.4]
17.912	Mt. Hamilton	10	+0.37	− 4.5
18.470	Paris	13	+0.25	− 5.0
18.471	Toulouse	13	+1.23	− 6.1
18.477	Arcetri	13	+1.28	− 7.3
18.490	Besançon	9	+0.24	+ 1.7
18.521	Paris	13	+0.35	− 4.6
19.513	»	15	+0.49	− 1.1
19.920	Mt. Hamilton	14	+0.54	− 5.8
20.415	Strassburg	16	+0.68	− 6.8
20.486	Arcetri	16	+1.23	−13.4
June 20.502	Besançon	16	$+0^s.58$	$-2''.2$
20.757	Washington	16	−0.06	− 7.8
20.898	Mt. Hamilton	16	+0.56	− 4.8
21.469	Arcetri	18	+1.31	− 3.7
21.469	»	17	+1.18	− 3.3
21.550	Paris	18	+0.43	− 8.1
22.778	Philadelphia	20	−0.26	− 7.0
22.918	Mt. Hamilton	20	+0.05	− 4.3
23.456	Strassburg	23	+0.45	− 6.5
23.456	»	19	+0.33	− 5.1
23.469	Hamburg	22	+0.12	−13.4
23.786	Philadelphia	23	+0.36	− 4.7
23.925	Mt. Hamilton	21	+0.40	− 4.1
24.787	Philadelphia	24	−0.23	− 6.1
24.912	Mt. Hamilton	24	+0.34	− 2.2
24.946	»	26	+0.46	− 4.6
25.499	Arcetri	25	+0.82	− 3.3
25.499	»	27	+0.89	− 9.1
25.920	Mt. Hamilton	28	+0.43	− 2.7
26.917	»	31	+0.40	− 5.5
27.457	Nicolajew	32	−0.24	+ 1.5
27.916	Mt. Hamilton	34	+0.20	− 2.5
28.449	Nicolajew	33	+0.07	− 5.0
28.461	Arcetri	37	+0.70	−10.7
28.461	»	36	+0.89	− 8.1

1898	Place	*	$\Delta\alpha \cos\delta$	$\Delta\delta$
June 28.546	Padua	39	$+0^{s}05$	$-4''0$
28.930	Mt. Hamilton	39	+0.23	−5.0
29.461	Nicolajew	38	+0.25	−1.1
29.554	Padua	41	+0.28	−3.1
30.552	Arcetri	42	+0.83	−4.7
July 1.929	Mt. Hamilton	43	+0.07	−2.9
2.943	»	44	+0.04	−4.1
8.936	»	45	−0.26	+3.5
9.984	»	46	+0.17	+3.3
11.964	»	48	−0.06	−2.0
12.500	Strassburg	47	+0.22	−2.7
12.500	»	50	+0.15	−0.6
12.950	Mt. Hamilton	51	−0.15	−2.4
12.970	»	49	−0.05	+0.1
13.968	Mt. Hamilton	52	−0.06	−1.8
14.553	Padua	53	−0.41	−2.1
14.977	Mt. Hamilton	54	−0.11	−0.3
15.506	Strassburg	58	−0.07	−0.4
15.556	Padua	58	−0.25	−2.4
15.589	Arcetri	58	+0.17	−5.1
15.589	»	59	+0.33	−7.8
15.960	Mt. Hamilton	56	−0.26	+1.4
16.536	Kremsmünster	55	+0.17	+6.4
16.539	Strassburg	57	+0.12	−1.3
16.550	Kremsmünster	57	+0.04	−4.4
16.587	Arcetri	55	+0.20	+7.6
16.587	»	57	+0.48	+4.2
16.968	Mt. Hamilton	60	−0.15	+1.6
17.585	Arcetri	61	+0.80	+4.2
17.969	Mt. Hamilton	62	−0.18	−0.4
18.595	Arcetri	64	+0.23	−3.4
18.975	Mt. Hamilton	65	−0.39	+1.2
18.986	»	63	—	+3.7
18.995	»	63	−0.08	—
19.981	»	67	−0.15	−0.7
19.992	»	68	−0.31	−0.2
20.594	Arcetri	66	−0.05	+9.3
20.974	Mt. Hamilton	69	−0.29	+1.3
21.523	Göttingen	72	−1.08	+5.8
21.584	Arcetri	70	+0.38	−1.6
21.584	»	72	+0.10	−5.0
21.970	Mt. Hamilton	71	−0.25	+1.3
22.979	»	74	−0.18	−0.3
23.982	»	73	—	+2.2
23.992	»	73	−0.30	—
24.979	Mt. Hamilton	76	−0.23	+1.3
24.990	»	75	−0.55	+0.1
25.985	»	78	−0.29	+1.0
25.996	»	77	—	+3.6
25.999	»	77	−0.27	—
26.989	»	79	−0.25	+2.1
27.988	»	80	−0.33	+3.1
28.990	»	81	−0.32	−0.3
29.987	»	82	−0.42	+1.5
29.996	»	83	−0.30	+1.1
July 30.986	Mt. Hamilton	87	$-0^{s}07$	$+4''2$
30.996	»	86	−0.27	+2.3
Aug. 2.005	Mt. Hamilton	88	−0.36	−2.6
2.997	»	90	−0.06	−1.3
3.004	»	91	−0.10	−1.0
4.997	»	93	−0.17	—
4.997	»	94	−0.14	+0.5
5.003	»	93	—	+0.5
5.006	»	92	—	+1.6
5.010	»	92	−0.22	—
6.001	»	97	−0.22	+1.3
6.007	»	98	—	−2.5
6.010	»	98	−0.25	—
6.998	»	99	−0.15	−0.3
7.999	»	100	−0.04	+1.5
8.999	»	101	+0.02	+0.5
11.006	»	102	−0.24	−3.6
11.013	»	102	—	−3.4

In forming the normal places the observations were given equal weight. Although most of the series of observations are too short to warrant the assignment of different weights, several of the same observers made more extended sets of observations on Comet 1898 I from which results weights could be assigned with considerable probability. It would seem, for instance, that the observations at Mt. Hamilton, Strassburg and perhaps one or two other places, are deserving of double weight. Such a course would only serve, however, to emphasize in the solution the already predominant influence of the Mt. Hamilton observations.

Signor A. Abetti's results (Arcetri) are undoubtedly affected by a constant personal error in right ascension, as may easily be seen from the tabulation of observations. In a longer series made by the same observer with the same instrument on Comet 1898 I (Astr. Nachr. Erg.-H. 3) in the period March–June, 1898, this personal equation is likewise well marked. For Comet 1898 I a constant correction of $-0^{s}37$ was applied to Abetti's results in right ascension. In the formation of the normal places for this comet the Arcetri values of $\Delta\alpha \cos\delta$ have been reduced similarly by the arbitrary correction $0^{s}5$.

Some error is probable in the observation made at Bamberg. A change of 10^{m} in the time will give satisfactory agreement, but as the conditions were evidently unfavorable it has seemed preferable to reject.

g) Formation of Normal Places.

As the comet did not pass near any of the planets the perturbations during the relatively short apparition period are exceedingly small. These perturbations have been computed at intervals of sixteen days for the epoch of osculation 1898 Aug. 14.0, and all the planets except Uranus and Neptune have been included.

No.	1898	$\Delta\alpha \cos\delta$	Pert.$_\alpha$	n	wt.	$\Delta\delta$	Pert.$_\delta$	n	wt.
I	June 19.0	+7.″86	−0.″27	+8.″13	31	−5.″04	−0.″26	−4.″78	29
II	» 26.5	+3.84	−0.23	+4.07	22	−5.00	−0.15	−4.85	22
III	July 9.5	+0.21	−0.15	+0.36	9	−0.87	−0.04	−0.83	9
IV	» 16.0	−1.58	−0.10	−1.48	16	−0.04	−0.01	−0.03	16
V	» 21.0	−5.04	−0.08	−4.96	13	+1.04	0.00	+1.04	13
VI	» 27.0	−4.50	−0.06	−4.44	11	+1.80	0.00	+1.80	11
VII	Aug. 6.5	−2.42	0.00	−2.42	12	−0.68	0.00	−0.68	13

The normal places are then as follows:

1898	α	δ
June 19.0	58° 27′ 51.″93	+57° 40′ 4.″89
26.5	69 33 24.34	+55 7 59.21
July 9.5	86 33 7.36	+48 9 0.27
16.0	93 54 56.34	+43 25 27.41
July 21.0	99° 8′ 36.″62	+39° 13′ 16.″23
27.0	105 2 26.49	+33 30 41.21
Aug. 6.5	114 53 20.29	+21 46 31.14

h) Least Square Solution.

The differential coefficients were computed by the formulae of v. Oppolzer (Lehrbuch zur Bahnbestimmung, II, S. 405-6). The corresponding equations of condition are given below in their homogeneous weighted form, the coefficients being logarithmic.

Equations of condition.

x	y	z	u	v	w	=
9.7145n	9.8474	9.8433	9.8956n	0.0000	9.9792n	0.0000
9.5935n	9.5983	9.5937	9.5031n	9.9409	9.9822n	9.6250
9.2942n	8.7527	8.9343	9.2017	9.7073	9.7740n	8.3776
9.3703n	8.4853n	8.6992	9.6131	9.7810	9.8378n	9.1166n
9.3003n	8.9489n	8.3174	9.6819	9.6790	9.7215n	9.5967n
9.2615n	9.1397n	8.1545	9.7247	9.5467	9.5683n	9.5123n
9.3714n	9.3633n	8.8222	9.7768	9.2554	9.2490n	9.2676n
9.8088	0.0000n	0.0000n	9.9969	9.8557	9.8025	9.7548n
9.8328	9.9731n	9.9629n	0.0000	9.6651	9.8911	9.7011n
9.7526	9.7751n	9.7612n	9.8284	9.1853	9.8510	8.7404n
9.9249	9.8718n	9.8700n	9.9438	9.1543	0.0000	7.4234n
9.9132	9.7913n	9.8104n	9.8892	8.9954	9.9485	8.9182
9.9136	9.6915n	9.7566n	9.8449	8.8396	9.8704	9.1202
0.0000	9.5153n	9.7666n	9.8907	8.6645	9.6793	8.7337n

In the above equations the factors for homogeneity are:

$x = [8.8471]\, dT \qquad u = [0.2336] \sin i'\, d\Omega'$

$y = [0.7822]\, d\log q \qquad v = [0.4855]\, di'$

$z = [0.4256]\, d\pi' \qquad w = [9.5313]\, de$

log unit error = 1.6558.

As a check on the computation of the differential coefficients the original elements were changed by the following increments:

$dT = +0^d.0001$

$d\log q = +0.00001$

$d\pi = +10'' \qquad d\pi' = +6''.25$

$d\Omega = +10 \qquad d\Omega' = +4.65$

$di = +10 \qquad di' = +13.11$

$de = -0.00001$

An ephemeris was computed for the normal dates with the changed elements and the values of the increments substituted in the equations of condition. Below are given the results from the two operations.

1898	cos δ Δα Ephemeris	cos δ Δα Equations	Δδ Ephemeris	Δδ Equations
June 19.0	+9.″95	+9.″81	+1.″44	+1.″38
26.5	+9.51	+9.41	−0.10	−0.15
July 9.5	+8.00	+8.08	−1.86	−1.88
16.0	+7.01	+6.96	−2.16	−2.24
21.0	+6.17	+6.10	−2.19	−2.29
27.0	+5.05	+4.98	−2.07	−2.13
Aug. 6.5	+2.82	+2.78	−1.39	−1.34

A first solution showed considerable uncertainty in the values of both $d\pi'$ and de. Changing the order, so that the values for π' and e came last, and solving for the other unknowns in terms of π' and e gave only a slight improvement, so the normal equations were formed anew to a greater number of significant figures. The coefficients (in natural numbers) of these equations are:

a	b	c	d	e	f	n
+4.892322	−3.910354	+4.496642	−0.137401	−4.366301	+5.357407	−1.095386
	+4.260483	−5.002828	−0.532116	+4.260496	−4.528772	+1.976268
		+6.689381	+1.352849	−4.887064	+4.466266	−2.435746
			+3.559704	−0.326027	−1.695587	+0.330451
				+4.465302	−4.931292	+1.799236
					+7.182246	−1.568715
						+2.097670

The elimination equations resulting are:

$$
\begin{array}{rrrrrrcl}
[0.6895151]x + & [0.5922161_n]y + & [0.6528883\;]u + & [9.1379899_n]v + & [0.6401137_n]z + & [0.7289547\;]w & = & [0.0395672_n] \\
& [0.0549959\;]y + & [0.1488293_n]u + & [9.8074931_n]v + & [9.8868188\;]z + & [9.3921392_n]w & = & [0.0416863\;] \\
& & [9.9073737\;]u + & [9.8340257\;]v + & [8.9166013\;]z + & [9.8831058_n]w & = & [8.7975099_n] \\
& & & [0.4177101\;]v + & [8.9166066_n]z + & [0.0167618_n]w & = & [9.9891097\;] \\
& & & & [8.5348127\;]z + & [8.7981463\;]w & = & [9.0471619\;] \\
& & & & & [8.0549576\;]w & = & [7.7986506_n]
\end{array}
$$

Values of the unknowns.

$$
\begin{array}{rcll}
dT & = & +0^d.000812 & \pm 0^d.00350 \\
d\log q & = & -0.0001260 & \pm 0.0000824 \\
d\pi' & = & +72''.54 & \pm 26''.97 \\
d\Omega' & = & -36.67 & \pm 20.32 \\
di' & = & +\;4.25 & \pm\;4.32 \\
de & = & -0.000358 & \pm 0.000533
\end{array}
$$

$[nn6] = 103''.2$

$[pvv] = 104''.6$ (equations) $= 104''.2$ (ephemeris).

Giving as the elliptic elements which best satisfy the observations:

$$
\begin{array}{rcl}
T & = & 1898 \text{ Aug. } 16.20790 \text{ Greenw. M. T.} \\
\omega & = & 205^\circ\,38'\;9''.53 \\
\Omega & = & 259\;\;5\;41.47 \\
i & = & 70\;\;1\;54.88 \\
\log q & = & 9.7968240 \\
e & = & 0.999642
\end{array}
\quad \text{(}\omega, \Omega, i\text{: 1898.0)}
$$

By these elements the sum of the squares of the weighted residuals has been reduced from 4298″ to 103″.

From the size of the probable error of e it will be seen that the orbit is essentially parabolic. Regarding $e = 1$ the following parabolic elements were derived:

Parabolic elements.

$$
\begin{array}{rcl}
T & = & 1898 \text{ Aug. } 16.20558 \text{ Greenw. M. T.} \\
\omega & = & 205^\circ\,37'\,39''.45 \\
\Omega & = & 259\;\;5\;54.69 \\
i & = & 70\;\;1\;52.15 \\
\log q & = & 9.7968783 \\
e & = & 1.0
\end{array}
\quad \text{(}\omega, \Omega, i\text{: 1898.0)}
$$

The sum of the squares of the weighted residuals is 110″ for the parabolic elements as against 103″ for the elliptical.

The residuals (elliptic elements) are as follows for the normal dates:

1898	$\Delta\alpha \cos\delta$	$\Delta\delta$
June 19.0	+0″.07	+0″.26
26.5	+0.44	+0.40
July 9.5	−1.41	−1.20
16.0	−1.47	−0.31
21.0	+1.08	−0.24
27.0	+0.24	−0.25
Aug. 6.5	+0.58	+0.65

The elements show close resemblance to those of Comet 1785 I. The orbit of this comet was computed by Méchain, and the elements, when reduced to the mean ecliptic of 1898.0, are as follows:

Comet 1785 I.

$$
\begin{array}{rcl}
T & = & 1785 \text{ Jan. } 27.325 \text{ Greenw. M. T.} \\
\omega & = & 205^\circ\,38'\,44'' \\
\Omega & = & 265\;47\;38 \\
i & = & 70\;14\;14 \\
\log q & = & 0.058198 \\
e & = & 1.0
\end{array}
\quad \text{(}\omega, \Omega, i\text{: 1898.0)}
$$

For all the elements of the orbit the agreement is very close, with the exception of the perihelion distance, which is nearly twice as great in the case of Comet 1785 I.

Kosmos Steamship »Anubis«, Acajutla, San Salvador, 1909 Aug. 2.

Heber D. Curtis, Laura Shearer Richardson. *)

*) Mrs. *Richardson* is responsible for the computation of the ephemeris and the re-computation of parallax factors; the rest of the work, in its present form, was done by Mr. *Curtis*.

(402) Chloë. Correzione all'effemeride (V. R. I. 37): 1909 Ott. 17 -13^m17^s $-49'.2$ Gr. $11^m.8$. *E. Bianchi.*

(539) Pamina. Korrektion der Ephemeride (V. R. I. 37): 1909 Okt. 25 $+4^m36^s$ $+11'.6$. *C. F. Pechüle.*

(628) [1907 XT]. Correction des coordonnées pour la date de l'opposition (B. J. 1911): 1909 Oct. 21 $-0^m.8$ $+6'$. *M. Simonin.*

1908 CW (Newtonia). Correction to ephemeris (A. N. 4364): 1909 Oct. 12 -1^m28^s $-8'.2$. Magnitude $13^m.0$. The date of opposition is Oct. 28 instead of 25. *Z. Daniel.*