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Periodic Comet Tempel (3) - Swift

Notes on the possibility of its future recovery.

By Mr. P. RAMENSKY.

This very faint comet was first discovered by Tempel in 1869, but the periodicity was established only in 1880 after its recovery by L. Swift. It was last seen in 1908 having been observed at four apparitions in 1869, 1880, 1891 and 1908. This comet can be detected only at such perihelion passages which occur in October or November, and it is too faint to be observable at any other conditions. Originally, the period of revolution was close to 5 1/2 years and the recoveries followed after each two revolutions. This regular motion was considerably disturbed by the action of Jupiter for the first time during the 1897-1902 revolution, so that the next favourable passage recurred after a 17-year interval. But the perturbations in the 1908-1914 revolution were by far much more considerable. The comet came to perihelion in July 1914 and the period was lengthened to 5 years 10 months. Had it not undergone the action of its " père de famille " again, we would have chance in searching for it in the end of this year. But the effect of perturbations has been still in the same direction and accordingly to computations by Dr. A. C. D. Crommelin the time of perihelion passage in 1932 was still in April, the period having increased to 6 years less 3 weeks.

Not so long ago. I have undertaken the computations on the 1932-1938 revolution, upon request of Mr. Levin, the Director of Computing Section of the British Astronomical Association The perturbations have been again very considerable and two systems of elements : that by Crommelin for 1932 and a new one are given below for comparison.

T 1932 April 4,15 (1938 March 14,25)	ΔT 1938 = 54^d,38	T 1938 May 7.63
ω 153°41'	$\Delta\omega$ 1950 = 7°,728	ω 161°49
Ω 249°55' 1932,0	$\Delta\Omega$ 1950 = − 8,203	Ω 241,81
i 10°23'	Δi 1950 = + 2,908	i 13,28
log q 0,1225 (q = 1,326)	Δq = 0,1568	q 1,483
Period 5,9413 years	Δp = 0^y,2232	Period 6.1645 gaussian years

The growth of perturbations of rectangular coordinates is shown in the accompanying table

Perturbations of rectangular equatorial co ordinates, referred to 1950,0 *(in units of the seventh decimal)*

	ξ	η	ζ		ξ	η	ζ
1932 Apr. 3	0	0	0	1933 May 8	− 1 0374	+ 625	+ 2581
May 13	− 7	− 17	− 8	June 17	− 1 4683	+ 1138	+ 3974
June 22	− 54	− 57	− 29	July 27	− 2 0151	+ 1766	+ 5854
Aug. 1	− 177	− 135	− 49	Sept. 5	− 2 6941	+ 2499	+ 8332
Sept. 10	− 427	− 218	− 45	Oct. 15	− 3 5226	+ 3319	+ 1 1538
Oct. 20	− 885	− 277	+ 13	Nov. 24	− 4 5194	+ 4194	+ 1 5621
Nov. 29	− 1652	− 283	+ 159	1934 Jan. 3	− 5 7045	+ 5080	+ 2 0762
1933 Jan. 8	− 2849	− 211	+ 434	Feb. 12	− 7 1001	+ 5910	+ 2 7178
Feb. 17	− 4607	− 44	+ 888	Mar. 24	− 8 7310	+ 6591	+ 3 5132
Mar 29	− 7067	+ 232	+ 1580	May 3	− 10 6250	+ 6988	+ 4 4955

		ξ	η	ζ
1934	June 12	− 12 8142	+ 6908	+ 5 7062
	July 22	− 15 3340	+ 6066	+ 7 1994
	Aug. 31	− 18 2274	+ 4039	+ 9 0439
	Oct. 10	− 21 5336	+ 192	+ 11 3288
	Nov. 19	− 25 2927	− 6448	+ 14 1658
	Dec. 29	− 29 5275	− 1 7328	+ 17 6884
1935	Feb. 7	− 34 2224	− 3 4535	+ 22 0385
	Mar. 19	− 39 2899	− 6 0787	+ 27 3273
	Apr. 28	− 44 5481	− 9 9057	+ 33 5719
	June 7	− 49 7422	− 15 1677	+ 40 6395
	July 17	− 54 6189	− 21 9488	+ 48 2578
	Aug. 26	− 59 0073	− 30 1689	+ 56 0971
	Oct. 5	− 62 8454	− 39 6511	+ 63 8595
	Nov. 14	− 66 1542	− 50 2015	+ 71 3150
	Dec. 24	− 68 9973	− 61 6566	+ 78 2953
1936	Feb. 2	− 71 4532	− 73 9005	+ 84 6719
	Mar. 13	− 73 5999	− 86 8653	+ 90 3360
	Apr. 22	− 75 5087	− 100 5288	+ 95 1841
	June 1	− 77 2402	− 114 9115	+ 99 1064
	July 11	− 78 8426	− 130 0785	+ 101 9797
	Aug. 20	− 80 3476	− 146 1435	+ 103 6607

Osculation date 1936 July 11.0

		ξ	η	ζ
1936	July 11	0	0	0
	Aug. 20	+ 966	− 867	− 562
	Sept. 29	+ 3666	− 3293	− 2199
	Nov. 8	+ 7817	− 7069	− 4840
	Dec. 18	+ 1 3156	− 1 2059	− 8414
1937	Jan. 27	+ 1 9433	− 1 8206	− 1 2859
	Mar. 8	+ 2 6413	− 2 5542	− 1 8115
	Apr. 17	+ 3 3894	− 3 4223	− 2 4133
	May 27	+ 4 1740	− 4 4566	− 3 0876
	July 6	+ 4 9952	− 5 7127	− 3 8308
	Aug 15	+ 5 8834	− 7 2812	− 4 6386
	Sept. 24	+ 6 9327	− 9 2984	− 5 4993

Osculation date 1937 August 15,0

		ξ	η	ζ
1937	Aug. 15	0	0	0
	Sept. 24	+ 117	− 186	− 165
	Nov. 3	+ 424	− 704	− 608
	Dec. 13	+ 901	− 1503	− 1243
1938	Jan 21	+ 1612	− 2572	− 1956
	Mar. 3	+ 2706	− 3726	− 2560
	Apr 12	+ 4176	− 4577	− 2804
	May 22	+ 5447	− 4735	− 2576

Osculation date 1938 April 12,0

The effect of perturbations since July 11, 1936 was quite small, e. g. the period has increased by 0,5 day only.

There were two intermediate osculations. Saturn's action was taken into account, too.

It may be interesting to make an inspection of the gradual transformation of the orbit since the discovery.

1869 III	T Nov 18	ω 106°14′	Ω 296°45′	i 5°24′	log q 0,027	Period 5,48 years
1897 (predicted)	June 5	107 00	296 27	5 23	0,037	5,55 »
1908 II	Oct. 5	113 41	290 19	5 27	0,062	5,68 »
1914 (predicted)	July 21	139 23	264 23	7 09	0,092	5,83 »
1932 »	April 4	153 46	249 55	10 23	0,123	5,94 »
1938 »	May 7	161 29	241 48	13 17	0,171	6,16 »

The distance at perihelion and the period have been constantly increasing, and a resemblance of this change, as well as of other elements, to that of first Tempel's comet (1867 II) is worth of mention. This may be a common law for comets having their aphelia inside the orbit of Jupiter and near to it.

The present elements indicate a favourable position only in 1956. It will be a tough proposition to pick up such faint body after eight revolutions since it had been last seen. Yet the example of Daniel's comet (1909 IV) so successfully recovered in January has proved that the calculation of perturbations deserves attention even in those cases when an orbit was determined from a single apparition. It should be noted, however, that a comparatively close approach to Jupiter will be again in 1947 and if the action would be in the same way, the recovery can happen one revolution earlier than indicated, or in 1952.

If the magnitude of this comet be represented by

$$m = 13.0 + 10 \log r + 5 \log \Delta$$

the maximum brightness at the most favourable conditions is now by 4 ½ magnitudes smaller than it could be in 1869 and by 3 mag. less than in 1908. Most probably the magnitude at future apparitions will not exceed 13 0, as the minimum of $10 \log r + 5 \log \Delta$ is now almost equal to zero. Yet even such brightness is well within the reach of photographic means and it is to be hoped that this very much interesting comet will be recovered some day in the future, provided it has not yet been disintegrated or has not faded much due to the loss of the matter contained in it.

(69 Slavianskaya Rue Kharbin, Mandchourie)

Observations de Comètes faites à l'Observatoire de Besançon, avec l'Equatorial Coudé

par M. P. Chofardet

1937	T. U.	Δ AR	Δ DP	Cp	AR 1937.0	Log f p	DP 1937.0	Log f p	*
				Comète Whipple (1937 *b*)					
	h m s	m s	′ ″		h m s		° ′ ″		
Août 3	21 42 28	+ 0 54,70	+ 3 1,9	9:6	15 57 22,72	9,471	70 25 36,1	0.665n	1
5	22 4 2	+ 1 1,24	+ 5 22,4	9:6	16 0 49,12	9,513	71 48 8,3	0,693n	2
6	22 28 33	− 0 49,07	− 0 40,3	9:6	16 2 33,46	9.548	72 29 29,8	0,713n	3
				Comète Wilk (1937 *c*)					
Mars 2	19 47 5	− 1 46,45	− 7 14,1	6 8	0 43 8,79	9,639	66 22 23,6	0,775n	4
2	20 10 33	− 1 44,07	− 8 36,2	6:6	0 43 11.17	9,635	66 21 1,5	0,794n	4
3	18 46 10	− 3 0,86	− 2 56.8	9:12	0 45 45	9,633	65 2	0,722n	5
10	19 53 19	− 0 39.23	+ 6 25,7	9:6	1 7 6,21	9,688	54 30 30,0	0,746n	6
12	18 56 6	− 1 32,73	− 1 20,2	9:6	1 14 11,50	9.703	51 23 35,4	0,649n	7
15	19 7 31	+ 2 19.19	+ 1 13,6	9:10	1 26 41,69	9,601	46 28 7,5	0,628n	8
				Comète Finsler (1937 *f*)					
Juil. 9	1 10 2	− 1 12,02	− 0 38,2	9:6	3 10 46,65	9,724n	48 21 39,7	0,727n	9
9	1 46 37	− 1 10,39	− 1 43,1	9:6	3 10 48.28	9,727n	48 20 34,8	0,672n	9
20	1 1 14	− 3 50,22	+ 6 58,4	9:12	3 29 45,68	9.813n	37 43 22,4	0,628n	10
30	2 19 55,3	− 3 43,45	− 5 37,3	6:8	4 49 19.55	0.074n	19 34 7,8	0,196n	11
Août 5	21 30 9,0	+ 2 48,48	+ 4 1,2	3:4	10 49 29,11	0,138	14 32 28,3	0,656n	12
6	20 54 54,8	+ 2 43,57		3	11 34 30,36	0.115			13
6	20 55 14,0		− 5 27,9	3			17 29 48,4	0,481n	13
10	21 0 44,9	− 2 52,76		6	13 4 6,22	9,865			14
10	21 0 35,7		− 1 27,3	8			32 48 32,5	0,472n	14
11	20 41 32,6	− 3 44,76		6	13 14 34,36	9,813			15
11	20 41 27,0		− 8 29,2	8			36 49 1,1	0,451n	15

Positions moyennes des étoiles de comparaison

*	Gr.	AR 1937,0	DP 1937,0	Autorités		*	Gr.	AR 1937,0	DP 1937,0	Autorités	
		h m s	° ′ ″					h m s	° ′ ″		
1	8,8	15 56 28,02	70 22 34,2	AG Berl. A	5718	9	8,4	3 11 58,67	48 22 17,9	AG Bonn	2731
2	7,4	15 59 47,88	71 42 45,9	AG Berl. A	5737	10	8,8	3 33 35,90	37 36 24,0	AG Camb.	1547
3	9,5	16 3 22,53	72 30 10,2	rap. à Berl. A	5763	11	8,3	4 53 3,00	19 39 45,1	Green. (1904)	1313
4	8,6	0 44 55.24	66 29 37,7	Abbadia	371	12	9,0	10 46 40,63	14 28 27,1	AG Kasan	2055
5	9,3	0 48 46	65 5	BD + 24°	126	13	8,9	11 31 46,79	17 35 16,3	Green. (1897)	2247
6	8,4	1 7 45,44	54 24 4,3	AG Lund	502	14	7,0	13 6 58,98	32 49 59,8	AG Helsing.	7455
7	8,5	1 15 44,23	51 24 55,6	AG Lund	553	15	7,4	13 18 19,12	36 57 30,3	AG Camb.	4265
8	8,3	1 24 22,50	46 26 53,9	AG Bonn	1232						

(1) * 3 rapp. à AG Berlin A. 5763 : Δ AR = − 1m49s,08 : Δ DP = − 0′5″1.