

Orbits :

Double Star	<i>P</i>	<i>e</i>	<i>a</i> "	Computer	Reference
ADS 1631	283	0.54	1.20	Vidal	<i>P. Obs. Santiago</i> , 5, 54
" 2765	195.4	0.008	0.324	Arend	<i>B.A.B.</i> , 3, 294
" 7203	1067.1	0.814	6.20	Baize	<i>J. Obs.</i> , 31, 33
" 8032	74.85	0.51	0.58	Baize	<i>J. Obs.</i> , 31, 33
" 8739	115.7	0.443	1.256	Baize	<i>l'Ast.</i> , 62, 55
" 10087	131.96	0.6185	0.934	Rabe	<i>A.N.</i> , 276, 60
" 12889	224.68	0.7617	2.048	Rabe	<i>A.N.</i> , 276, 49
" 16538	137	0.8	...	Vidal	<i>P. Obs. Santiago</i> , 5, 11
" 16800	47.9	0.43	0.21	Russell	<i>P.A.S.P.</i> , 60, 64
1 ^h 30 ^m .4 — 30°	4.556	0.295	0.192	Voûte	<i>P. Riverview</i> , 2, 64
8 ^h 54 ^m .2 — 42°	21.02	0.15	0.62	Baize	<i>J. Obs.</i> , 31, 33

Vidal (*P. Obs. Santiago*, 5) writes on the apparent orbits of visual double stars; Rabe (*A.N.*, 276, 49) on orbit correction by variation of the radius vector and its velocity; Rakowiecki (*Bull. Soc. Amis Sciences*, Poznan, Série B, No. 8) on orbit determinations by Thiele's method.

Miscellaneous.—Hirst (*M.N.*, 107, 477 and *U.O.C.*, 5, 172) derives the mass ratio and parallax of M1bO 4; Binnendijk (*A.J.*, 54, 21) of ADS 11077; van de Kamp for various binaries (*A.J.*, 53, 34, 39, 43, 165, 226) and has notes on the orbital interpretation for unresolved astrometric binaries (*A.J.*, 53, 47) and the mass of the unseen companion in Zeta Cancri (*A.J.*, 53, 207).

McLeod (*P.A.S.P.*, 59, 316) writes on the nodal passages of visual binaries, Mateer (*P.A.S.P.*, 59, 315) on the dwarf double star ADS 8242, Mannino and Rosino (*P. Bologna*, 5, No. 6) on the position of the components of visual binaries in the Russell diagram and Jonckheere (*C.R.*, 226, 65) on faint double stars and (*Obs.*, 68, 150) on the outlook for double star astronomy.

W. H. VAN DEN BOS.

COMETS

The year 1948 proved to be quite as busy a one for observers of comets, and computers of their orbits, as 1947. Even excluding comet 1948 a, which has been counted as belonging to 1947, the number of new comets found was ten, a record—one more than in 1947—and it included one bright comet, the comet of the eclipse of November 1, which was a brilliant spectacle in the south during November. Three of these comets were discovered by Carl A. Wirtanen on the special proper motion programme plates made with the Carnegie astrograph at the Lick Observatory. No less than three of the new ones have been found to have orbits of short period: 1948 b, 1948 i and 1948 n. Two previously known periodic comets also were recovered, Forbes and Neujmin (1). In all, twenty-four comets were observed during the year (one more than in 1947) and included the two "annual" ones and ten from 1946 and 1947; and at the end of the year there were no less than fifteen comets considered to be still under observation.

The Schwassmann-Wachmann (1) and Oterma comets were as usual observed at around opposition and are not designated by annual lettering. The former,

at opposition in January, was recorded at around eighteenth magnitude, by G. van Biesbroeck at the Yerkes Observatory and H. M. Jeffers at the Lick Observatory, and followed till March, and from November onwards. Oterma's comet came under observation again in October, at seventeenth magnitude, and was the subject of special study at the Turku Observatory by Miss L. Oterma herself.

Of the other comets of the previous two years, Jones's comet 1946 h and Bester's 1946 k, were both observed again during the year. The former was photographed for the last time this year on November 23 by Jeffers at 19^m, and the latter by Van Biesbroeck on October 3 at 18^m. The periodic comet Faye, 1947 f, was followed till March 28 when it was 18^m (Jeffers). Whipple's periodic comet, 1947 g, which came to perihelion at the end of June (1948), was still under observation at the end of the year; it was recorded by L. Boyer at Algiers on December 29 as 14^m.5. Wirtanen's comet, 1947 h, was followed during the summer and until October 2 when Van Biesbroeck last photographed it, with the 82-inch reflector at the McDonald Observatory, and estimated its brightness as 20^m. The new periodic comet Reinmuth(2), 1947 j, was last photographed by Jeffers on February 1 and estimated as 17^m.7; a further attempt to do so in October was unsuccessful. Bester's comet, 1947 k, well observed early in the year, brightening to sixth magnitude in March, was last recorded by Jeffers on November 11 at eighteenth magnitude, but was considered still observable in 1949. The periodic comet Schwassmann-Wachmann(2), 1947 l, came to perihelion in the latter part of August and was about fifteenth magnitude early in January 1949. The bright southern comet, 1947 n, could only be followed till January 20, 1948, when Van Biesbroeck noted it as 10^m.5.

1948 a, the first comet announced this year, was actually first seen in Serpens on 1947 December 20, by Antonín Mrkos, at the Skalná Pleso Observatory in the Tatra mountains of Czechoslovakia, in the course of a systematic search for comets which is part of the regular programme there. It appeared as a ninth magnitude object without central condensation. Unfortunately, owing to twilight and a subsequent run of bad weather, it could not then be confirmed and was therefore not announced. Happily Mrkos himself succeeded in finding it again on January 18, then a diffuse object of tenth magnitude, with a short tail. Subsequently the position of an image of it, found on a plate taken on January 10, was reported by B. Protitch of Belgrade.

The comet remained at about tenth magnitude till the beginning of February, with a coma of about 2' diameter condensed to a centre containing a faint nucleus. By March it had faded to thirteenth magnitude but was followed until December 5, when it was last recorded at the Skalná Pleso Observatory, at 16^m. The computation of the definitive orbit has been undertaken by E. Buchar (Prague).

1948 b was the intrinsically faint periodic comet discovered by Carl A. Wirtanen, in Taurus, on a plate exposed for two hours for the special proper motion programme with the Carnegie 20-inch ($f/7.4$) astrographic camera of the Lick Observatory, on January 15.2. It was a diffuse object of the sixteenth magnitude, showing a tail about 1'.4 in length. The brightness was fading but the comet was followed till March 11 when a 90-minute exposure by Jeffers with the Crossley reflector showed it at nineteenth magnitude.

1948 c refers to an image, in appearance like that of a comet of fifth magnitude, found (at approx. α 7^h 14^m, δ +69°) near the edge of a photograph taken by

Keuskamp, a Dutch physician and amateur astronomer, on March 7.0. The presence of a comet was however not confirmed with certainty. Reports of observations of it on March 9 (8^m) at Leiden, subsequently stated to be not certain, and on March 15 (10^m) at Kiev (*Ast. Circ.*, U.S.S.R., 72), were published but are not supported by other evidence. A sky-patrol plate of the area taken at Sonneberg twenty-seven hours previous to Keuskamp's does not show any comet in the area, and other visual and photographic searches made after the announcement failed to locate it. The evidence therefore seems to be against this having been a real object.

1948 d, a comet of the tenth magnitude, was found first by Miss Ludmila Pajdušáková, in Hercules, on March 13.1 during a routine search for comets with the special *Somet* binoculars (100 mm., $\times 25$) used for this work at the Skalná Pleso Observatory. She then wrongly identified it with a faint nebula, NGC 6615, shown in the new Skalná Pleso star atlas*. Antonín Mrkos, however, realized that she could not have seen this nebula with these binoculars and, later the same night, he was successful in locating and photographing the new comet with the $23\frac{1}{2}$ -inch Zeiss reflector.

It appeared a rather small object, $1\frac{1}{2}'$ in diameter, with but little condensation, magnitude 10.5. It brightened but slightly as it approached perihelion ($q=2.1$ A.U.) in May, being then $9^m.5$, of $2'$ diameter, condensed to a bright centre with a stellar nucleus about $12^m.5$, and having a tail seen as about $9'$ long, in a 6-inch refractor (P. Brown). It passed within a few degrees of the North Pole in November and was still circumpolar and under observation at the end of the year, about thirteenth magnitude. The computation of the definitive orbit has been undertaken by V. Guth (Prague).

1948 e, the periodic comet Forbes, was detected by Hamilton M. Jeffers at the Lick Observatory with the 36-inch Crossley reflector ($f/5.8$) on May 14.3. The two plates he exposed showed the small diffuse images of the comet within the "rays" of Spica. It was of the seventeenth magnitude, and though some three magnitudes fainter than expected, it was nearly in the position predicted by F. R. Cripps's elements. Later photographs showed a trace of tail. At perihelion in September the comet was still faint and only slightly brighter than fifteenth magnitude. It was recorded as of that magnitude when last observed at the McDonald Observatory, on October 2, by Van Biesbroeck.

1948 f, the periodic comet Neujmin (1) was detected by Seth B. Nicholson with the 100-inch reflector at Mt. Wilson on May 6.4 (i.e. before 1948 e), magnitude 17.5. A point of special interest about this comet has been its nearly stellar appearance and, on this occasion, it was reported as without coma. Actually two images of non-stellar objects were found on the plates, a little over a degree from the place predicted by Van Biesbroeck's elements, but the identification of the one attributed to the comet was confirmed by observations with the 60-inch reflector at Bosque Alegre (Argentina) by David McLeish in July and at Yerkes by Van Biesbroeck in September. It was last recorded this year by Van Biesbroeck on November 29 at fourteenth magnitude, and by McLeish on December 3.

1948 g was the comet first seen faintly with the naked eye, in Perseus on June 3.7 (*not* 2.7), by the Japanese amateur astronomer Minoru Honda, a farmer at Seto-mura (Hiroshima), and then confirmed with his 6-inch reflector. It was

* A. Bečvář, *Atlas Coeli Skalná Pleso*, Prague, 1948; also published by the Sky Publishing Corp., Harvard College Observatory, 1949.

independently discovered the next night by the Italian amateur, Giovanni Bernasconi, at Cagno (Como) while sweeping for comets, and later on June 5 also by Tosikazu Higasi on board ship returning to Japan from the eclipse expedition of May 9. At discovery the comet was of magnitude $3\frac{1}{2}$, the coma having a diameter of 7' or 8' with a very bright centre and nucleus, and a tail several degrees in length. For a week it remained a faint naked-eye object. It faded slowly till July 4, when it was about $8^m.7$, but then with the most unexpected rapidity, reaching sixteenth magnitude in mid-August and nineteenth on September 3 (Van Biesbroeck), nearly five magnitudes fainter than even the r^{-6} law predicted.

1948h, another faint comet discovered by Carl A. Wirtanen this year, was found in Equuleus, also on a programme plate of the 20-inch ($f/7.4$) Carnegie astrograph of the Lick Observatory, exposed for two hours on July 15.4. The trail showed a coma about 6" in diameter with a central nucleus, and a tail about 2' long, the total brightness being $15^m.5$. It was then ten months before perihelion passage but the comet showed little brightening in the following months. Boyer and Van Biesbroeck gave its photographic magnitude as 14 early in September, but Jeffers as 16.5 on November 23, the last observation in this year.

The pursuit of this comet led Wirtanen to the discovery, on a plate exposed for the comet on July 18, of the interesting minor planet 1948 OA which passed the Earth at a distance of only 0.125 A.U. on August 10.

1948i was the comet first discovered by Joseph Ashbrook, a Yale astronomer, while on a visit to the Lowell Observatory to observe minor planets, on a plate taken in Aquarius for 1327 Namaqua with the 13-inch refractor on August 26.3. It was found independently by Cyril Jackson at the Yale-Columbia Station at Johannesburg on a plate taken later the same day (August 26.8) while experimenting in the use of his small Aldis camera (20-inch focus, $f/5.6$) for patrol work for fast-moving minor planets.

The comet was diffuse, centrally very condensed to a nearly stellar head or nucleus, and had a short tail, the total brightness being about eleventh magnitude. Johnson reported the tail as appearing semi-circular on plates taken at the Union Observatory on August 29.9, and a photograph taken at Oxford on September 12.0 showed a faint loop outlined which approximated to this description. Visual observers noted a coma of about $\frac{3}{4}$ ' diameter, fanning out to 2' or 3', the nucleus being eccentrically placed in the forward part of the coma, and Van Biesbroeck's photographs of September 2 (*P.A.*, 56, 447, 1948 October) show a skew appearance of the inner coma. The comet faded slowly and was still under observation, about fourteenth magnitude, at the end of the year.

The orbit was found to be elliptical, with a period of $7\frac{1}{2}$ years. L. E. Cunningham made a preliminary investigation of the previous path (*U.A.I.C.*, 1185) and found the comet had been in close proximity to Jupiter for several years around 1942, the minimum distance having been about 0.3 A.U. in July 1945. The effect was to decrease the size of the orbit so much as to reduce the period by about two years to its present value. As the comet must be a fairly large one to have been relatively so bright at its perihelion distance of 2.3, the present orbit, with its moderate eccentricity (0.4), gives hope that it may be possible to observe the comet, with large instruments, throughout most of its path.

1948j, a faint diffuse comet, was discovered by Ernest Leonard Johnson, in Sculptor, on a plate taken with the Franklin Adams camera for the minor planet

programme, at the Union Observatory, Johannesburg, on September 1.8. Its magnitude was 13.5, a round diffuse uncondensed object. It had passed perihelion on April 9 but, at its comparatively large perihelion distance of 4.7 A.U., it moved away slowly and faded only to the fifteenth magnitude by mid-November. It was still under observation at the end of the year.

1948k, the third faint comet discovered by Carl A. Wirtanen this year, was also found on a programme plate of the 20-inch Carnegie astrographic camera at the Lick Observatory, namely on one taken on October 7.2. It was a diffuse object of fourteenth magnitude, showing a tail about 1' in length. It faded gradually and, when last photographed this year, on December 2.8, it was 15^m.0 (Boyer).

1948l made a spectacular appearance at the total eclipse of the Sun on November 1, a very bright object, probably brighter than zero magnitude, within two degrees of the Sun's centre, with a long tail stretching down to the horizon. Photographs of the eclipse, taken from an aeroplane of the Royal Air Force in Kenya, while flying at a height of 13,000 ft., show good images of the comet and even some of the tail, although the exposures were only $\frac{1}{300}$ second (camera: 8-inch focal length, $f/5.6$). The next certain report of it came from Captain Frank McGann of Pan American-Grace Airways, who found it independently, on November 4 while flying at 16,500 ft. near Kingston, Jamaica. Within three days it was reported as a new discovery by many others, in the southern hemisphere, who had been unaware of the observation of it during the eclipse. By that time its brightness had faded to about the first magnitude, but for some days it made a fine object in the southern skies, with a tail 20° long.

Van den Bos, observing it with the 9-inch refractor at Johannesburg on November 14.1, found a small, but not stellar, nucleus and a little "fountain" projecting from it towards the Sun, then curving back into the tail. A photograph taken at the Radcliffe Observatory at Pretoria on November 15.1, with a short exposure with a stationary camera of 7-inch focal length ($f/2.5$), recorded a long straight faint streamer at an angle of about 9° to the main tail. Other photographs showed a number of streamers in the main tail—a series of sixteen long-exposure plates showing structural changes in the tail (see *P.A.S.P.*, 60, 393) was obtained by Shane and Wirtanen between November 11 and December 10, with the 20-inch astrograph at Lick.

This comet maintained its intrinsic brightness well, and on December 20.5 was still of the sixth magnitude, with a coma of 5' diameter, a nucleus of magnitude 10½, and a tail visible for 2° in binoculars (Albert Jones). It was of the eighth magnitude when first seen in England, on December 30.0, and was well observed in the new year.

1948m was a comet discovered by Michiel Johan Bester, in Volans, on a plate exposed for two hours in the 3-inch Ross R.B. camera, during routine patrol work at the Boyden Station at Bloemfontein on November 24.0, and confirmed by Johnson at Johannesburg the next night. It had a small head with a bright nucleus, hardly any coma, and a tail about 3' in length. The total magnitude was 7.8. By the end of the year, when it was coming north, it had faded to about the eleventh magnitude.

1948n, the second comet discovered by Minoru Honda, the Japanese amateur, this year, was found by him at the eastern end of Hydra, before dawn on December 3.9, while searching for comets: a diffuse object of about ninth

magnitude without, he stated, a nucleus or tail. It was independently found by Miss Ludmila Pajdušáková on December 6.2 during a routine search with a Somet binocular comet seeker (100 mm., $\times 25$) at the Skalná Pleso Observatory in Czechoslovakia. Owing to the onset of twilight, however, she could not make certain of it and thought it to be the nebula M 83. The next night Antonín Mrkos, at the same observatory, not knowing of this, also found the comet during his sweeps, and confirmed it. Van Biesbroeck, observing it two days later, described it as having a centrally condensed coma some 2' in diameter, with a nucleus, and a tail faintly indicated towards 290° . It faded with extraordinary rapidity, becoming an extremely diffuse object. Such diffuseness doubtless accounts for the discrepancies in the reported magnitudes. Between 1949 January 8 and 10, observations by Mrkos and Johnson indicated it was about fourteenth magnitude, while those by Van Biesbroeck and Jeffers made it seventeenth or eighteenth.

A. Schmitt (Algiers) found the orbit to be elliptical, with a period of about five years. He has undertaken the computation of the definitive elements. The preliminary elements, he has remarked, show a similarity to those of Biela's comet. A period of 5.3 years would imply a very close approach to Jupiter two and a half revolutions ago, about August 1935, when the comet would have been at aphelion and very near its ascending node.

In closing this review of 1948 it is worth recording that the situation as regards work on comets in the southern hemisphere was strengthened this year by the occasional use of the 60-inch reflectors at the Bosque Alegre Observatory in the Argentine, and at the Boyden Station of the Harvard College Observatory in South Africa, for recording comets when too faint for other available instruments; and also by the immediate computation of preliminary orbits by W. P. Hirst, an amateur astronomer at the Cape.

The table of the elements of cometary orbits which follows is arranged as in the last two reports: the comets are listed in order of perihelion date; the symbol P/ indicates a periodic comet, and *p* after the perihelion date that the elements were predicted ones. The perihelion date, deduced from observations, when not given in a set of elements in the table, will be found in the notes appended.

REFERENCES AND NOTES TO TABLE OF ELEMENTS

- 1887 V P/Olbers. (1) Hans Q. Rasmusen, *Pub. Copenhagen Obs.*, No. 147, 1948. Definitive, being a revision of Ginzel's work, including recomputation of perturbations linking to 1815. Osc. epoch 1887 October 5.5. He predicts return: *T* 1956 June 15.9.
- 1916 II P/Neujmin (2). (2) G. N. Neujmin, *Bul. Poulkovo Obs.*, No. 141; 17 (6), 21, 1948. Definitive revision combining 1927 with 1916. Osc. epoch 1916 April 10.0.
- 1925 IV P/Tempel (2). (3) P. Ramensky, *Tokyo Astron. Bul.*, No. 615, 1942. Definitive, combining 1930 with 1925. Osc. epoch 1925 September 7.0. Yamamoto's *P.G.C.* makes it 1925 V.
- 1927 I P/Neujmin (2). (4) G. N. Neujmin, *Bul. Poulkovo Obs.*, No. 141; 17 (6), 23, 1948. Definitive, after combining with 1916. Osc. epoch 1926 October 12.0.
- 1929 III P/Neujmin (3). (5) Itaru Imai, *Journal Shanghai Sci. Inst.*, Section I, 1, 1938. Definitive, from 30 observations covering 64° around September 4. The accurate elements by Bowes and Willis, *L.O.B.*, 14 (417), 130, 1929, are in good agreement.
- 1930 VIII P/Tempel (2). (6) P. Ramensky, *Tokyo Astron. Bul.*, No. 615, 1942. Definitive, after combining with 1925. Osc. epoch 1930 November 20.0.

Table of the Elements

Comet		T G.M.T. before 1925.0 U.T. from 1925.0	q	e
1887 V	P/Olbers	1887 Oct. 8.4761	1.199109	0.930974
1916 II	P/Neujmin (2)	1916 Mar. 11.3155	1.339829	0.566493
1925 IV	P/Tempel (2)	1925 Aug. 7.0423	1.313284	0.560086
1927 I	P/Neujmin (2)	1927 Jan. 16.2336	1.338168	0.566823
1929 III	P/Neujmin (3)	1929 June 28.7421	2.042362	0.584538
1930 VIII	P/Tempel (2)	1930 Oct. 5.7896	1.318691	0.558856
1935 II	P/Reinmuth (1)	1935 Apr. 29.8733	1.855808	0.503718
		1935 Apr. 29.9138	1.855797	0.503853
1939 IV	P/Väisälä	1939 Apr. 26.0826	1.762299	0.634239
1942 VI	P/Wolf (1)	1942 June 23.5625	2.437385	0.404776
1943 V	P/Schaumasse	1943 Nov. 25.8050	1.202971	0.704347
1945 a	P/Pons-Winnecke	1945 July 10.5854	1.159230	0.654913
1946 a	Timmers	1946 Apr. 13.2635	1.724147	1.001201
1947 h	Wirtanen	1947 July 18.4598	2.827976	1.001045
1948 k	Wirtanen	1947 Sept. 4.7349	3.346054	1.0
1948 b	P/Wirtanen	1947 Dec. 3.5862	1.647932	0.560204
1948 a	Mrkos	1948 Feb. 16.6885	1.499362	1.0
1948 j	Johnson	1948 Apr. 9.3928	4.710514	1.0
1948 g	Honda-Bernasconi	1948 May 15.9062	0.207707	1.0
1948 d	Pajdušák.-Mrkos	1948 May 16.6228	2.106894	1.0
		1948 May 16.6233	2.106870	1.0
1947 l	P/Schw.-Wach. (2)	1948 Aug. 23.577p	2.152365	0.383651
1948 e	P/Forbes	1948 Sept. 16.1176	1.545187	0.552735
1948 i	P/Ashbrook-Jack.	1948 Oct. 4.7464	2.311069	0.395587
1948 m	Bester	1948 Oct. 22.917	1.27390	1.0
		1948 Oct. 22.9367	1.274137	1.0
1948 l	Eclipse Comet	1948 Oct. 27.4320	0.135335	1.0
1948 n	P/Honda-Mrkos-P.	1948 Nov. 17.7868	0.560295	0.815943
		1948 Nov. 17.5682	0.557655	0.809179
1948 f	P/Neujmin (1)	1948 Dec. 19.130p	1.544414	0.774568
1948 h	Wirtanen	1949 May 1.1170	2.517909	1.0

REFERENCES AND NOTES TO TABLE OF ELEMENTS (*continued*).

- 1935 II P/Reinmuth (1). (7) F. R. Cripps, *Handbook B.A.A.*, 1949. From differential correction of Kanda and Hirose's elements, with three (partly four) observations. Corrected value mean motion $n=0^{\circ}.1363003$ assumed. Osc. epoch 1935 January 30.0. *Handbook* value of e should read "0.5037185". (8) G. Merton, MS. From differential correction of Foxell and Levin's predicted elements, with same three (partly four) observations, and Cripps's perturbations, and mean motion corrected for assumed error in applying perturbation $w.\Delta n$ instead of Δn , giving corrected $n=0^{\circ}.1362462$. Osc. epoch 1935 January 30.0.
- 1939 IV P/Väisälä. (9) Miss L. Oterma, *Handbook B.A.A.*, 1949. Definitive from observations covering 94^d. Osc. epoch 1939 March 18.0.
- 1942 VI P/Wolf (1). (10) M. Kamiński, *C.R.M. Acad. Pol. (Sci.)*, 1948 January, No. 1. Definitive: his system Q4 satisfying observations 1925-1933/34-1943. Osc. epoch 1942 June 10.0.
- 1943 V P/Schaumasse. (11) Michael Sumner, MS. Accurate orbit after linking 1927 to 1944 observations. Osc. epoch 1944 March 31.0.
- 1945 a P/Pons-Winnecke. (12) J. G. Porter, MS. Semi-definitive, from 42 observations covering 126^d and linking with his 1939 definitive elements. Osc. epoch 1945 March 26.0.

of Cometary Orbits

Period (years)	ω	Ω	i	Equinox	Computer	Ref.	Comet
72.41	65.3464	85.3686	44.5713	1950.0	Rasmusen	1	1887 V
5.43	193.7829	327.6716	10.6291	1925.0	Neujmin	2	1916 II
5.16	186.5834	121.1387	12.7710	1950.0	Ramensky	3	1925 IV
5.43	193.7315	328.0027	10.6325	1950.0	Neujmin	4	1927 I
10.90	140.7799	158.2191	3.6879	1929.0	Imai	5	1929 III
5.17	186.5991	121.1212	12.7569	1950.0	Ramensky	6	1930 VIII
7.23	8.7885	125.1723	8.0613	1950.0	Cripps	7	1935 II
7.23	8.8114	125.1674	8.0641	1950.0	Merton	8	1935 II
10.58	44.3449	135.5634	11.2707	1950.0	Oterma	9	1939 IV
8.29	160.9685	204.3420	27.3031	1950.0	Kamieński	10	1942 VI
8.21	50.9175	86.9276	12.0818	1950.0	Sumner	11	1943 V
6.16	170.1081	94.4551	21.6938	1950.0	Porter	12	1945 a
...	54.3233	128.9118	72.8475	1946.0	Schmitt	13	1946 a
...	9.3839	311.0980	97.3270	1950.0	Cunningham	14	1947 h
...	75.2808	121.5320	154.9503	1948.0	Cunningham	15	1948 k
7.25	344.0063	86.3178	13.4976	1948.0	Cunningham	16	1948 b
...	61.9224	198.5648	77.5402	1948.0	Cunningham	17	1948 a
...	191.8987	139.6973	53.2527	1948.0	Bobone	18	1948 j
...	317.0433	203.1328	23.1617	1948.0	Cunningham	19	1948 g
...	66.9064	246.9217	92.9202	1948.0	Schmitt	20	1948 d
...	66.9068	246.9203	92.9195	1948.0	Cunningham	21	1948 d
6.53	358.1003	126.0201	3.7239	1950.0	Rasmusen	22	1947 l
6.42	259.741	25.445	4.621	1950.0	Cripps	23	1948 e
7.48	348.8936	2.3126	12.5134	1948.0	Bobone	24	1948 i
...	274.2306	66.9461	87.6217	1950.0	Naur	25	1948 m
...	274.2552	66.9189	87.6233	1948.0	Franklin	26	1948 m
...	107.2609	210.2994	23.1239	1948.0	Cunningham	27	1948 l
5.31	184.2600	233.1548	13.1591	1950.0	Schmitt	28	1948 n
5.00	183.8282	232.9606	13.1460	1950.0	Cunningham	29	1948 n
17.93	346.7345	347.2207	15.0294	1950.0	v. Biesbroeck	30	1948 f
...	229.9276	119.8644	130.2686	1948.0	Cunningham	31	1948 h

1946 a Timmers. (13) A. Schmitt, *J.O.*, **31**, (12), 199, 1949. From 38 observations at Algiers, covering 264^d, with perturbations included. Osc. epoch 1946 March 21.0.

1947 h Wirtanen. (14) L. E. Cunningham, *H.A.C.*, No. 921. Represents seven observations covering 294^d, perturbations not included. Residuals around 1".

1948 k Wirtanen. (15) L. E. Cunningham, *H.A.C.*, No. 966. Represents seven observations covering 14^d.

1948 b P/Wirtanen. (16) L. E. Cunningham, *H.A.C.*, No. 892. Represents seven observations covering 13^d.

1948 a Mrkos. (17) L. E. Cunningham, *H.A.C.*, No. 924. Represents 12 observations covering 123^d.

1948 j Johnson. (18) Jorge Bobone, *U.A.I.C.*, No. 1186. Represents six observations covering 26^d.

1948 g Honda-Bernasconi. (19) L. E. Cunningham, *H.A.C.*, No. 915. Represents 11 observations covering 9^d.

1948 d Pajdušáková-Mrkos. (20) A. Schmitt (Algiers), *U.A.I.C.*, No. 1152. From his own 14 observations covering 62^d. (21) L. E. Cunningham, *H.A.C.*, No. 938. Represents 12 observations covering 97^d.

- 1947 l P/Schwassmann-Wachmann (2). (22) Hans Q. Rasmusen, *Pub. Copenhagen Obs.*, No. 148, 1948. Prediction based on his previous work (*ibid.*, Nos. 106, 128). Osc. epoch 1949 January 4.0. Observations indicated T 1948 August 23.5978.
- 1948 e P/Forbes. (23) F. R. Cripps, *Handbook B.A.A.*, 1949. From prediction based on his 1942 orbit corrected by $\Delta T = 0^d.5$, with 1948 T corrected by $-0^d.07645$ (Cunningham), and a accordingly.
- 1948 i P/Ashbrook-Jackson. (24) Jorge Bobone, *H.A.C.*, No. 958. Representing 11 observations covering 67^d , with only two residuals exceeding $1''$.
- 1948 m Bester. (25) Peter Naur, *U.A.I.C.*, No. 1199. From three observations covering 31^d . (26) Kenneth Franklin (Berkeley), *U.A.I.C.*, No. 1202. From observations covering 31^d .
- 1948 l The Eclipse Comet. (27) L. E. Cunningham, *H.A.C.*, Nos. 971, 972. Representing 23 observations covering 35^d .
- 1948 n P/Honda-Mrkos-Pajdušáková. (28) A. Schmitt, *U.A.I.C.*, No. 1202. From five observations covering 33^d . (29) L. E. Cunningham, *H.A.C.*, No. 975. Representing 19 observations covering 34^d .
- 1948 f P/Neujmin (1). (30) G. van Biesbroeck, *A.J.*, **44**, 116, 1935. Prediction based on his revision of the orbit 1913–1931. 1948 December observations indicate T December 15.9, but residuals of several minutes of arc remain, indicating a further revision of the orbit will be necessary.
- 1948 h Wirtanen. (31) L. E. Cunningham, *H.A.C.*, No. 957. Representing 11 observations covering 73^d , with only two residuals exceeding $1''$.

ADDITIONAL NOTES

- 1889 VI P/Swift. Jessica Young Stephens: "Study of the orbits computed for comet 1889 VI"; *A.J.*, **54**, 48, 1948. She investigated the range of solutions in the elements with 85 observations covering 1889 November 16 to 1890 January 21, and found the value of the period could lie between 7.82 and 10.03 years; and computed the perturbations 1889–1916. She concluded that identity with comet 1916 II P/Neujmin (2), or with Barnard's unidentified comet of 1905 July 22.5, was not possible, and that no prediction could be made for a return.
- 1892 III P/Holmes. F. Koebeke: "On the Orbit of Comet Holmes (Part I—Preliminary Researches)"; *Poznan Reprint* No. 12, 1948. He has rediscussed the three available apparitions of 1892, 1899 and 1906, and, after a preliminary computation of perturbations, has obtained semi-definitive elements for them, preparatory to definitive work and prediction.
- 1943 I Whipple-Fedtke-Tevzadze. J. Gadowski: "Definitive curve of the total light variability of comet Whipple-Fedtke-Tevzadze (1942 g), deduced from 996 visual observations of more than 36 different European observers by the aid of a new formula in consideration of the dislocation in time of the curve relatively to the moments of passage of the comet through perihelion and perigee"; *Pub. Warsaw Univ. Obs.*, **13**, Part 1, Cracow, 1947.
- 1947 i P/Encke. Professor L. Matkiewicz has confirmed that he gave the element ϕ incorrectly in the elements predicted for 1947 (*U.A.I.C.*, No. 1090), as was suggested in the last report. The correct predicted value was $57^\circ 48' 31''.8$, giving $e = 0.846275$ and $q = 0.340981$ instead of the values indicated in the table, *M.N.*, **108**, 128, ref. 14.
- 1947 l P/Schwassmann-Wachmann (2). Rasmusen's work on the orbit, noted in the last report (*M.N.*, **108**, 128, ref. 21) is now published in *Pub. Copenhagen Obs.*, No. 148, 1948.
- P/Wolf (1). M. Kamiński: "The New Path of the Comet Wolf I"; *Bul. Acad. Polonaise Série A*, 1948. His painstaking investigations have revealed small but definite changes in the elements of the orbit, including the deceleration of the mean motion, after the very close approach (0.125 A.U.) to Jupiter in September 1922, which are not accounted for by the planetary perturbations as computed. Another paper (*ibid.*), "The Influence of Mercury on the Motion of the Comet Wolf I", leads to the conclusion that the action of Mercury cannot be the cause of the secular deceleration of the motion. And a third paper (*ibid.*) gives the prediction for the return of the comet in 1950.

Origin of Comets. A. J. J. Woerkom : " On the Origin of Comets "; *B.A.N.*, **10**, No. 399, 445, 1948. A critical discussion.

R. A. Lyttleton : " On the Origin of Comets "; *M.N.*, **108**, 465, 1948. Develops a theory that the Sun, moving through extensive interstellar dust clouds, causes aggregations (comets) to form by accretion, each along an axis in the direction of the relative anti-apex, at distances of the order of several hundreds of astronomical units from the Sun.

CORRIGENDA

107, 112, Comet 1935 II P/Reinmuth (1), ref. 21, line 6. For " H. Summer " read " M. Sumner ".

108, 124, line 2 of first paragraph of " Comets ". For " 1910 " read " 1927 IX ", and delete the rest of the sentence.

108, 124, line 11 from bottom. For " period " read " periodic ".

108, 126, line 24. For " June 26 " read " June 25 ".

108, 127, line 16 from bottom. For " 15 inch- " read " 15-cm. ".

108, 128, line 5 from bottom, P/Tempel (2). Add " The value of a 3.0437225, based on Ramensky's prediction (*M.N.*, **107**, 100, refs. 60 and 61), was assumed ".

G. MERTON.