THE INTERNATIONAL COMET QUARTERLY

JULY 1980 VOL. 2, NO. 3

EPHEMERIS FOR P/COMET STEPHAN-OTERMA 1980g (cf. page 43)

Date	ET	R. A. (1950)	Decl.	Delta	r	Elong.	Mag.
1980	09 18	04 13.37	+00 06.4	1.227	1.853	111.9	12.5
1980	09 28	04 29.59	+01 00.9				
1980	10 08	04 44.76	+02 10.4	0.985	1.736	122.2	10.9
1980	10 18	04 58.46	+03 44.0				
1980	10 28	05 10.28	+05 52.8	0.790	1.647	134.6	9.6
1980	11 07	05 19.73	+08 48.1				
1980	11 17	05 26.42	+12 38.7	0.653	1.591	150.9	8.6
1980	11 22	05 28.71	+14 55.2				
1980	11 27	05 30.33	+17 24.3	0.612	1.578	160.7	8.3
1980	12 02	05 31.31	+20 03.4				
1980	12 07	05 31.77	+22 48.9	0.594	1.575	171.1	8.2
1980	12 12	05 31.88	+25 36.3				
1980	12 17	05 31.83	+28 20.8	0.599	1.582	174.8	8.3
1980	12 22	05 31.85	+30 57.8				
1980	12 27	05 32.14	+33 23.6	0.628	1.599	165.2	8.6
1981	01 01	05 32.92	+35 35.3				
1981	01 06	05 34.38	+37 31.3	0.679	1.625	155.3	9.0
1981	01 16	05 39.88	+40 34.7				
1981	01 26	05 49.19	+42 37.9	0.838	1.705	138.4	10.3
1981	02 05	06 02.08	+43 49.9				
1981	02 15	06 17.98	+44 20.4	1.058	1.813	124.8	11.8

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INSIDE THIS ISSUE

THE INTERNATIONAL COMET QUARTERLY is a non-profit journal devoted to news and observation of comets. Issues are published four times per year (January, April, July, and October); the ICQ is published by the Physics Department of Appalachian State University, and is mailed from Boone, North Carolina. Subscription rates are $8.00 per year worldwide; subscribers who do not wish to be billed, and who will keep account of their own expiration dates, may subscribe at the rate of $5.00 per year. Make checks payable to THE INTERNATIONAL COMET QUARTERLY and send to the Editor at P-329, S.A.O.; 60 Garden St.; Cambridge, MA 02138, U.S.A. Group rates available upon request. Manuscripts will be reviewed for publication; they should be typewritten and double-spaced, and should be sent to the Editor. All cometary observations should be sent to C. S. Morris; Prospect Hill Rd.; Harvard, MA 01451, U.S.A. Back issues are available from Dr. T. L. Rokoske, Physics Dept.; A.S.U.; Boone, NC 28608, U.S.A.

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RECENT NEWS CONCERNING COMETS

Three periodic comets are expected to become bright enough later this year to come within the visual reach of small telescopes. P/Encke, P/Stephan-Oterma, and P/Tuttle are all predicted to become favorably placed with magnitudes brighter than 10. P/Tuttle was recovered by C.-Y. Shao and G. Schwartz using the 1.55-m reflector at the Agassiz Station of Harvard College Observatory in Harvard, Mass.; designated comet 1980h, this object was only of magnitude 19.5-20 on July 14 UT. More information concerning this comet, including an ephemeris, may be found on page 62 of this issue. P/Tuttle should become a binocular object later this year in the morning sky. [P/Encke report in Oct. 1980 issue.]

T. Seki (Geisei, Japan) recovered P/Honda-Mrkos-Pajdusakova as an object of total photographic magnitude 15 on exposures taken May 1 and 6. The object, designated Comet 1980c, was noted as being diffuse with condensation. I. Halliday, Herzberg Institute of Astrophysics, independently recovered this comet on a 10-minute exposure, taken May 7 with the Canada-France-Hawaii 3.6-m telescope at Mauna Kea, as a 14th-magnitude object with a faint tail about 40" long (p.a. 70 degrees) and with two faint streamers about 9" long (p.a. 30 and 60 degrees). This is an unfavorable apparition for this comet. (cf. IAUC 3472, 3474)

Paul Wild, Astronomical Institute of Berne University in Switzerland, discovered a new short-period comet with the 0.4-m Schmidt telescope at Zimmerwald. He noted total photographic magnitude 15.5 on exposures taken April 11 and May 7, as the object moved slowly west-southwestward in the northern regions of the constellation Virgo; the comet was then diffuse with an apparently strong central condensation. This object is the third periodic comet discovered by Wild, and it has been designated P/Wild 3 (1980d). Calculations by Brian G. Marsden, Harvard-Smithsonian Center for Astrophysics, show that this comet passed very close to Jupiter (0.13 AU) in August 1976; the resulting perturbations changed the orbit in

(Continued on page 61)

FAVORABLE APPARITION PREDICTED FOR P/COMET STEPHAN-OTERMA 1980g

Charles S. Morris and Daniel W. E. Green

ABSTRACT. P/Comet Stephan-Oterma 1980g should be favorably placed for observation as an object of total visual magnitude 8-9 in December 1980. Observations from the 1942-3 apparition yield a predicted magnitude formula $H = 1.66 + 5 \log \Delta + 38.71 \log r$, where H is the observed magnitude (corrected to a standard aperture of 6.78 cm), Δ and r are the comet's geocentric and heliocentric distances, respectively.

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Periodic Comet Stephan-Oterma was recovered as an 18th-magnitude object on plates taken by Hans-Emil Schuster at the La Silla station of the European Southern Observatory on June 13 and 19. This is only the third recorded apparition of this comet, which has a current period of 37.704 years, according to orbital elements by Yeomans (1980); the ephemeris on page 41 of this issue is based upon Yeomans' elements.

P/Stephan-Oterma 1980g was originally discovered by Jerome Coggia, at the Marseilles Observatory in France, on January 22, 1867. However, Eduard Stephan was director of the observatory at the time, and he released the news under the name "Comet Stephan." The German comet discoverer Wilhelm Tempel was also in Marseilles at the time, and he independently discovered the object on January 28. Vsekhsvyatskii (1964) notes that there are some observations of a faint tail upon occasion, and he estimates that the total visual magnitude faded from about 7 at discovery to about 12 when it was last seen on April 8. The comet (comet 1867 I) reached perihelion on January 20 (Marsden, 1979), two days before it was discovered, and its apparent path in the night sky carried it from Aries, past the Pleiades in Taurus in the third week of February, into Auriga in April. The comet's geocentric distance during the 1867 apparition increased from 1.1 AU at discovery to 1.9 AU on April 8.

Dr. Liisi Oterma recovered comet 1867 I on November 6, 1942, although it was thought initially that the object was a newly-discovered comet. Dr. Fred L. Whipple of Harvard College Observatory realized that the orbit of Comet Oterma was very similar to that of comet 1867 I, and the identification was made. Tevzadze of Abastumani Observatory (U.S.S.R) detected the object independently on December 26 at 10th magnitude, as did G. Neujmin (Kitab, U.S.S.R) on 1943 January 5 at magnitude 11.0.

The comet passed closest to the sun on December 19, and was designated comet 1942 IX. Eighty-five observations linking these first two apparitions reveal that the period lengthened from 37.1 years in 1867 to 38.8 in 1942 (Belous, et al. 1978). Comet 1942 IX moved north-northwestward in retrograde motion during November and the first half of December, and it passed by the earth at a distance of 0.631 AU during the first week of December; also during this period, photographic estimates find that the magnitude increased from 13 to 12 (Burton, et al. 1943; Giclas 1943). Krumpholz (1947) found the coma diameter to decrease from 2'-3' on December 1 to 1' on January 4.

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ANALYSES OF THE OBSERVATIONS. The authors examined the available visual magnitude observations of P/Stephan-Oterma at its previous turns. Data for these analyses were obtained in summarized form from Vsekhsvyatskii (1964); where possi-

(Continued on next page)

(Continued from page 43)
ble, the original references cited by Vsekhsvyatskii were checked. Most of the observations used for the 1942 apparition of the comet were made by van Biesbroeck (1943a, b). Ephemerides of P/Stephan-Oterma were provided by Dr. Brian Marsden and the second author at the Harvard-Smithsonian Center for Astrophysics.

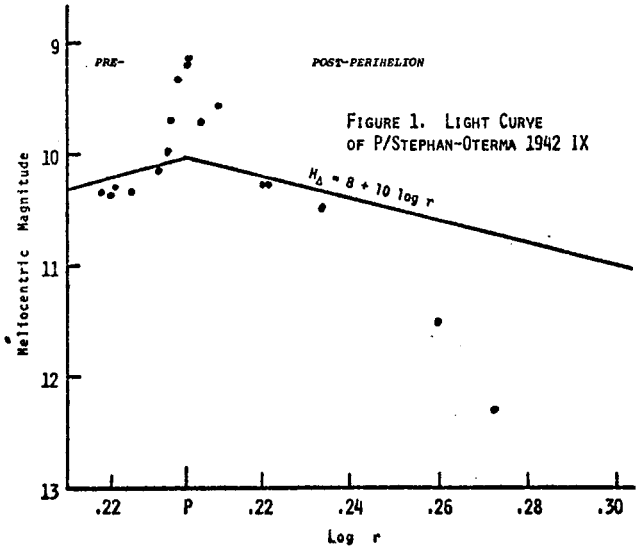

FIGURE 1. LIGHT CURVE OF P/STEPHAN-OTERMA 1942 IX

No accurate magnitude estimates are available from the comet's discovery apparition, although rough estimates were made, based upon the descriptive information, by Vsekhsvyatskii (1964). The brightness data does not warrant a formal analysis because Vsekhsvyatskii's magnitude estimates could be as much as two magnitudes in error. Despite the inaccuracy of the data, at least one conclusion appears reasonable: The comet probably attained at least 9th magnitude near perihelion. It is nevertheless difficult to conclude anything about the brightness parameter, n, during the discovery apparition.

More detailed observations of P/Stephan-Oterma's luminosity were made during the 1942/3 return. In particular, van Biesbroeck made a series of magnitude estimates using a 60-cm (24-inch) reflector; these observations are presented in Table I. Although most of the observations by van Biesbroeck were made visually, there is some ambiguity concerning the last three, which may have been obtained photographically; these 3 estimates were not included in the formal analysis presented here. Prior to analyzing the visual observations in Table I, they were corrected to a standard aperture of 6.78 cm by the method derived by Morris (1973); this correction for a 24-inch reflector amounts to -1.0 magnitude. The light curve of P/Stephan-Oterma based on the data in Table I is depicted in Fig. 1.

Several interesting features are present in this light curve presented in Figure 1. There appears to be a flare in brightness of about one magnitude immediately before perihelion. It is not clear from the observations whether or not this is a true flare in brightness or simply the result of a large value of n (the parameter which indicates how the comet's brightness varies with heliocentric distance). This paper assumes the latter is true. After perihelion there is a rapid decline in brightness, suggesting a value of n >> 4. For comparison, an inverse fourth-power (n = 4) magnitude formula is also plotted

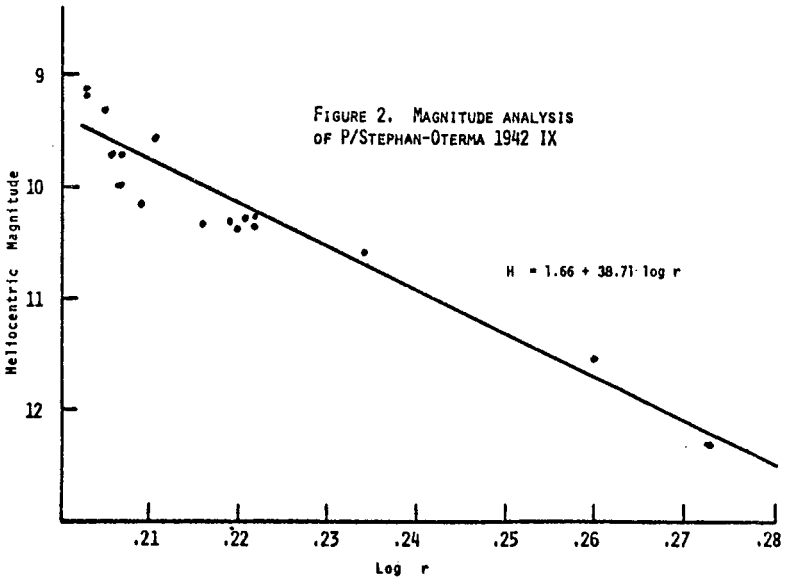

FIGURE 2. MAGNITUDE ANALYSIS OF P/STEPHAN-OTERMA 1942 IX

(Continued on next page)

(Continued from page 44)
with the light curve. It should be noted that the maximum heliocentric brightness does occur at perihelion.

Both pre- and post-perihelion observations were used to obtain a single magnitude formula; these 17 observations are listed in Table I, and the combined light curve is presented in Figure 2. A least squares fit to these observations gives:

(Continued on page 60)

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ICQ OBSERVATION REPORT FORM

Found on page 46 of this issue is the standard cometary observation report form which was published in the July 1979 issue of the ICQ. We ask that all individual observers as well as group recorders and coordinators use this form to report observations to the ICQ for publication. The large volume of data received necessitates this request. Photo-copies or even mimeograph copies (with an electic stencil) should be made of this form for more sheets; we cannot supply large numbers of these forms.

The report form is tabulated as follows: COLUMN 1. "Date (U.T.)": Here the time of the observation should be entered after local time has been converted to hundredths of a day and to UT (for explanation of UT, see p. 59). For example, May 5 at 9:30 p.m. Central Daylight Time would be May 6.10 UT, or 2:30 UT on May 6. COLUMN 2. "Total Magn.": Here the total estimated visual magnitude should be given to tenths of a magnitude; if tenths are not possible, or if bad conditions make the estimate difficult or not very reliable, put a colon (:) after the magnitude value. If the magnitude was a photographic estimate, put a "P" after the magnitude; if the estimate is a nuclear magnitude (which is ALWAYS fainter than or equal to the TOTAL magnitude), put a "$" after the estimated value. COLUMN 3. "Ref.": All magnitude estimates should be made with a reliable reference or source catalogue at hand. Out-of-focus images of the comet, for example, may be compared with out-of-focus images of stars, and stars similar to the comet in brightness are looked up in appropriate catalogues for their magnitudes. We strongly discourage the use of galaxies, nebulae, etc., as well as the use of mere ATLASES (which only contain graduated star sizes), for the making of magnitude estimates. Keys to references as used in the ICQ may be found in this issue on page 59, p. 39 of No. 34, and p. 6 of No. 33.

COLUMN 4. "Instrument Aperture": The aperture diameter of the instrument used for the observation, preferably given to tenths in centimeters; state units. COLUMN 5. "Instr. Type": The type of instrument used for the observation; use the Key on p. 26 of the April issue. COLUMN 6. "Power": The power or magnification of the instrument used for the observation. COLUMN 7. "Coma Diameter": The estimated diameter of the comet's coma in minutes of arc; convert seconds out to hundredths of a minute of arc. INCLUDE COLON IF ESTIMATE IS APPROXIMATE. COLUMN 8. "D.C.": Estimated degree of condensation on scale where 9 = stellar and 0 = diffuse. COLUMN 9. "Tail length, p.a., remarks": Estimated length of tail (if any) in degrees; convert minutes out to hundredths of a degree. Also give position angle (p.a.) in degrees, which is the direction in which the tail is positioned from the nuclear region (north = 0 degrees, east = 90 degrees). Any remarks concerning unusual features should also be given here; further remarks and drawings can be put on another sheet or on the back of copies of this form.

--D.W.E.G.

COMET OBSERVING REPORT FORM. Send completed sheets to INTERNATIONAL COMET QUARTERLY, c/o C. S. Morris, Prospect Hill Road, Harvard, MA 01451, U.S.A. PLEASE PRINT OR TYPE ONLY. Also, please convert observing times to decimals of a day (e.g., Aug. 3, 12:00 UT = Aug. 3.50 UT).

Xerox this sheet for more copies.

Name and designation of comet: COMET_____ 19____.

Observer_____ Address_____

Date (U.T.)	Total Magn.	Ref.	Instrument Aperture	Instr. Type	Power	Coma Diameter	D.C.	Tail length, p.a., remarks

ADDITIONS TO THE OBSERVER KEY.
Following are new additions to the Observer key (cf. Vol. 1, pp. 32ff. and 57, and Vol. 2, pp. 5 and 39):

AER	07	L. AERTS, BELGIUM
AND	07	C. R. ANDERTON, ENGLAND
BRE	07	T. BRELSTAFF, ENGLAND
BRO01	07	J. BROWN, ENGLAND
BRY	07	J. T. BRYAN, NE, U.S.A.
BRY01		THEN BRYANT, AUSTRALIA
BUR	07	S. F. BURCH, ENGLAND
CLA01	07	P. R. CLAYTON, ENGLAND
DEJ	07	F. A. DE JONG, AUSTRALIA
DIE01		STEFAN DIEFERS, AUSTRALIA
EBE	07	R. D. EBERST, SCOTLAND
FIL01	10	ERWIN FILIMON, WEST GERMANY
GAV	07	M. V. GAVIN, UNITED KINGDOM
GLI		GUNNAR GLITSCHER, WEST GERMANY
GLY	07	R. T. GLYNN, ENGLAND
GRI	07	D. P. GRIFFIN, ENGLAND
HOW	07	I. D. HOWARTH, ENGLAND
HUF	07	D. F. HUFTON, ENGLAND
KAJ	06	K. KAJIURA, JAPAN
LEW	07	J. LEWIS, UNITED KINGDOM
MAT04	12	T. MATSUMOTO, JAPAN
MOR03		WARREN C. MORRISON, CANADA
MOS	07	P. MOSY, ENGLAND
NAG01	12	H. NAGASAKA, JAPAN
NAG02	12	T. NAGATA, JAPAN
NAK04	06	I. NAKAMURA, JAPAN
PAC	07	M. F. PACE, ENGLAND
PLE		NORM J. PLEVER, AUSTRALIA
ROB01	07	J. ROBERTS, ENGLAND
SAT01	12	H. SATO, JAPAN
SEK01	12	SEKIGUCHI, JAPAN
SUN01	06	I. SUNAGA, JAPAN
VAN02	11	H. VAN ASPEREN, THE NETHERLANDS
VER01	07	A. A. VERSCHRAEGEN, BELGIUM
VIN	07	A. W. AND P. H. VINCE, ENGLAND
YOS01	06	K. YOSHIDA, JAPAN

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OBSERVATIONS OF COMETS.

Included in this issue are all of the observations of Comet Bradfield (1974 III) made by members of the Comet Section of the British Astronomical Association. The observations of Comet Kobayashi-Berger-Milon (1975 IX) are a continuation of the A.L.P.O. observations of this comet which were published in the last two issues of the ICQ.

The headings for the tabulated data are as follows: "DATE (UT)" = Date and time to hundredths of a day in Universal Time (see p. 59 for explanation of UT). "MAG." = total visual magnitude estimate; this is photographic if "P" is present in the next column, and it is a nuclear magnitude estimate if a "$" is present in the next column. A colon indicates that the observation is only approximate, due to bad weather conditions, etc. "R" = reference (cf. p. 59) for magni-

(Cont. from p. 47)
tude estimates, except for 'P' or '$'. "AP." = aperture in centimeters of the instrument used for the observations, usually given to tenths. "T" = type of instrument used for the observation (cf. ICQ Vol. 2, p. 26). "F/" and "PWR" are the focal ratio and power or magnification, respectively, of the instrument used for the observation. "COMA" = estimated coma diameter of the comet in minutes of arc. An ampersand (&) indicates an approximate estimate. "DC" = degree of condensation on a scale where 9 = stellar and 0 = diffuse; a slash (/) indicates a value midway between the given number and the next-higher integer. "TAIL" = estimated tail length in degrees; again, an ampersand indicates a rough estimate. "PA" = estimated measured position angle of the tail in degrees (north = 0, east = 90). "OBS" = the observer who made the observation (cf. p. 47). An asterisk between the DATE and MAG. columns indicates that the observation is an updated version of one already published in a previous issue of the ICQ, THE COMET QUARTERLY, or THE COMET.

Comet Bradfield (1974 III = 1974b)

DATE (UT)	MAG.	R	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1974 02 14.42	9		10.5	R		40		7/			THO
1974 02 15.5	9		20	L			2	5/			DEJ
1974 02 18.5	7.5		5.0	B		16	2	8			DEJ
1974 02 19.40	8.5		7.8	R				7		100	JON
1974 02 21.52	6.9		20	L		70	3				CLA
1974 02 23.52	6.6		12.5	R	5	70	3		0.03		CLA
1974 02 25.39	8.5		7.8	R				8	0.08	110	JON
1974 03 03.40	7.3	S	10.5	L		40	1.5		0.05	230	THO
1974 03 03.5	7.1		5.0	B		16	3	8			DEJ
1974 03 07.51	5.1		12.5	R	5	70	1		0.08		CLA
1974 03 09.03	7.1	A	20	L	5		4	2			SIM
1974 03 10.5	6.5		5.0	B		16	5				DEJ
1974 03 10.50	4.7		12.5	R	5	70	2		0.25		CLA
1974 03 11.5	6.4		5.0	B		16	5		0.13	109	DEJ
1974 03 15.00	5.0	S	8.0	B		15	2	9			BOR
1974 03 15.50	4.5		12.5	R	5	35	2		3.0		CLA
1974 03 16.50	4.4		12.5	R	5	35	2		2.0		CLA
1974 03 17.71	5.2		5.0	B		7	2.5	8	0.5	70	NIG
1974 03 19.00	4.2	S	5.0	B		10	3	9	0.5	100	BOR
1974 03 19.33	4.4	S	8.0	B		11			1.5	90	JON
1974 03 20.39	5.2	S	5.0	B		7	4		0.25	90	MAT01
1974 03 20.49	4.3		12.5	R	5	35	2		1.5		CLA
1974 03 20.82	5.0	T	11.5	R	15	70	3	8	0.13	88	RID
1974 03 21.01	4.5	S	5.0	B		10	1.9	8	1.5	95	BOR
1974 03 21.49	4.3		12.5	R	5	35	2		1.0		CLA
1974 03 21.71	4.8		5.0	B		7			4		NIG
1974 03 21.82	5.0	T	11.5	R	15	70	2	8			RID
1974 03 22.01	4.0	S	5.0	B		10			2	86	BOR
1974 03 23.01	4.2	S	5.0	B		10	1.4	8	1.5	87	BOR
1974 03 24.02	4.3	S	5.0	B		10	1.9	7	2.83	83	BOR
1974 03 24.08	4.5		25	L	5	80	6.5		1	80	BRY
1974 03 24.8	4.7		5.0	B		7			3.25		NIG
1974 03 25.02	4.4	S	5.0	B		10	2	8	3.17	83	BOR
1974 03 26.02	4.6	S	5.0	B		10	1.7	6	4.33	82	BOR
1974 03 28.02	4.6	S	5.0	B		10	1.9	6	4.00	74	BOR

Comet Bradfield (1974 III = 1974b) Cont.

DATE (UT)	MAG.	R	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1974 03 28.09	6.5		25	L	5	80			0.75	70	BRY
1974 03 29.03	4.3	S	5.0	B		10	1.8	6	2.67	74	BOR
1974 03 29.83	5.4		8.0	B		11					EBE
1974 03 29.84	5.7	T	11.5	R	15	70	2	7			RID
1974 03 30.80	5.2		10.5	B		25					ALC
1974 03 30.82	5.0		12	R		20	2	8	0.25	70	MIL01
1974 03 30.83	5.8	S	11.5	R	15	70	3.5	7	0.12	60	RID
1974 03 31.80	4.7		4.0	B		8		8	1.5	60	BUR
1974 03 31.80	5.4		10.5	B		25					ALC
1974 03 31.80	4.9		3.5	B	15	9					ROG
1974 03 31.81	5.7		5.0	B		7					HOW
1974 03 31.82	5.8	S	11.5	R		70	3	8	0.08	70	RID
1974 03 31.82	5.3		12	R		20	3		0.33	70	MIL01
1974 03 31.82	5	:	16.2	R		50	& 5	7	0.05		VIN
1974 03 31.83	5.0		5.0	B		7					CLA01
1974 03 31.84	5.6		8.0	B		11					EBE
1974 03 31.85	5.7		5.0	B		20		6	0.75	30	BRO01
1974 03 31.85	4.6		4.0	B		10			0.7	50	AND
1974 03 31.85	5.3	S	5.0	B		10	4	7	1.5	50	HUR
1974 03 31.90	5.0		3.0	B		8	2.5		0.11	60	GRI
1974 04 01.90	5.3		5.0	B		7					SHA02
1974 04 02.80	5.7		10.5	B		25					ALC
1974 04 02.80	5.1		3.0	B		8	4		0.33	60	GRI
1974 04 02.82	5.9	S	11.5	R	15	70	2.5	8	0.12		RID
1974 04 03.03	4.8	S	5.0	B		10	3.1	7	2.33	56	BOR
1974 04 03.80	4.4		5.0	B		7					SHA02
1974 04 04.80	5.0		10.5	B		25			2.00		ALC
1974 04 04.83	5.8	S	11.5	R	15	70	3.0	8	0.08	60	RID
1974 04 04.85	4.6		5.0	B		7		7			AND
1974 04 04.85	4.6	S	5.0	B		10	4.0	7	0.50		HUR
1974 04 04.90	4.8		8.0	B		11			2.00		MIL01
1974 04 04.90	5.0		5.0	B		7					SHA02
1974 04 04.90	5.0		3.0	B		8	4.0		0.75	40	GRI
1974 04 05.80	4.8		3.0	B		8	4.0		0.75	30	GRI
1974 04 05.80	5.2		10.5	B		25					ALC
1974 04 05.84	5.5	S	11.5	R	15	70	3.0	7	0.07	60	RID
1974 04 05.85	4.9		5.0	B		10	3.0	7			HOW
1974 04 05.87	5.0		12	R		20	5.0	8	0.50	40	MIL01
1974 04 05.88	5.2		7	R		10					FRY
1974 04 05.90	4.7		5.0	B		7	8.0				SHA02
1974 04 05.90	5.4		3.0	B		8					GLY
1974 04 06.83	6.0		5.0	B		20			0.25	35	BRO01
1974 04 06.84	6.1		5.0	B		10	5.0	8	1.00		DOH
1974 04 06.84	5.6	S	11.5	R	15	70	2.0		0.05	60	RID
1974 04 06.85	4.9	S	5.0	B		10	5.0	7	0.33	40	HUR
1974 04 06.88	5.1		3.0	B		8					GLY
1974 04 06.90	5.3		5.0	B		7	6.0				SHA02
1974 04 06.90	4.9		3.5	B		9					ROG
1974 04 07.83	6.2		5.0	B		20	5		0.75	30	BRO01
1974 04 07.84	6.0		5.0	B		7					CLA01
1974 04 07.84	5.5	S	5.0	B		10			1.50	30	HUR

Comet Bradfield (1974 III = 1974b) Cont.

DATE (UT)	MAG.	R	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1974 04 07.84	5.6	S	11.5	R	15	70	3.5	8	0.12	50	RID
1974 04 07.85	5.8		15	L		50	5		0.75		GAV
1974 04 07.85	5.1		5.0	B		16		5			HUF
1974 04 07.85	5.3		12	R		20	5.0	8	1.00	40	MIL01
1974 04 07.85	5.8		5.0	B		10			1.50		PAC
1974 04 07.86	5.1		8	B		11	4.5	7	0.75	40	PAN
1974 04 07.87	5.5		5.0	B		10	4.75	7	1.25		DOH
1974 04 07.88	5.1		3.0	B		8			1.0		GLY
1974 04 07.89	5.8		5.0	B		7	4	7	0.18	55	STU
1974 04 07.90	5.2		5.0	B		7	4.0	7	0.17		HOW
1974 04 07.90	5.2		5.0	B		7	8.0		0.25		SHA02
1974 04 08.04	5.1	S	5.0	B		10	3.2	7	2.50	40	BOR
1974 04 08.80	6.0		4.0	B		8		8	0.50	65	BUR
1974 04 08.80	5.8		5.0	B		10	5.5	7	1.00		DOH
1974 04 08.83	6.0		15	L		50	4		1.0		GAV
1974 04 08.83	6.3		5.0	B		16			0.38		ROB01
1974 04 08.84	5.8		5.0	B		7					CLA01
1974 04 08.84	6.2	S	11.5	R	15	70	3.0	7	0.08	50	RID
1974 04 08.84	5.3		5.0	B		16			0.50	10	HUF
1974 04 08.85	5.7		5.0	B		7	4	7	0.50	43	STU
1974 04 08.85	6.2		12	R		20		7			MIL01
1974 04 08.85	6.5		8.0	B		11					EBE
1974 04 08.85	5.8		7	R		10					FRY
1974 04 08.85	6.5		7.5	R		62	4.0	6	0.25	5	POT
1974 04 08.88	5.4		3.0	B		8			1.5		GLY
1974 04 08.88	5.8		5.0	B		7	4.0	7	0.50	50	GAI
1974 04 08.90	5.3		5.0	B		7	9.0		0.75		SHA02
1974 04 08.90	5.5		3.0	B		8					GRI
1974 04 09.80	6.0		5.0	B		10	4.5	7	0.58		DOH
1974 04 09.80	6.4	S	4.0	B		8		7		70	BUR
1974 04 09.83	6.7		5.0	B		20			0.33	30	BRO01
1974 04 09.83	6.6		8.0	B		11					EBE
1974 04 09.84	6.5		3.0	B		8		7	0.80	60	BRE
1974 04 09.85	6.3		5.0	B		10	3.0	6			POT
1974 04 09.86	6.5	S	11.5	R	15	70	3.0	8	0.08	50	RID
1974 04 09.86	6.0		7	R		10					FRY
1974 04 09.88	6.3		3.0	B		8					GLY
1974 04 09.88	5.7		5.0	B		7	2.5	6	0.50	20	GAI
1974 04 09.88	5.7		12	R		20	5.0	7	1.00		MIL01
1974 04 09.88	6.0		5.0	B		10			0.75		PAC
1974 04 09.90	5.6		3.0	B		8					GRI
1974 04 09.90	5.3		5.0	B		7	8.0		0.50		SHA02
1974 04 11.05	5.8	Y	5.0	B		10	4.5	6	2.33	50	BOR
1974 04 11.85	6.3		7	R		10	5				FRY
1974 04 11.85	6.9	S	11.5	R	15	70	2.5	6	0.07	45	RID
1974 04 12.87	7.0		16	L		50	3.0	7	0.25		LEM
1974 04 13.85	7.2		8.0	B		11					EBE
1974 04 13.86	7.4		10.0	B		14			0.23		AER
1974 04 13.90	6.3		8.0	B		10					GRI
1974 04 13.90	6.7		6.0	B		13			1.50	40	HEN
1974 04 13.92	6.5		7	R		10		5	0.25		FRY

Comet Bradfield (1974 III = 1974b) Cont.

DATE (UT)	MAG.	R	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1974 04 13.96	6.5		5.0	B		10	5.0	6	0.50		DOH
1974 04 14.06	6.5		25	L		48	5.5	7	0.33		DOH
1974 04 14.09	7.3		5.0	B		7	5	7	0.30	40	STU
1974 04 14.15	7.2		8.0	B		11					EBE
1974 04 14.83	6.3		5.0	B		16			0.50		ROB01
1974 04 14.85	7.3		8.0	B		11					EBE
1974 04 14.85	6.8	S	5.0	B		7					CLA01
1974 04 14.85	7.3		3.0	B		8					GLY
1974 04 14.85	7.9	S	5.0	B		10	20.0	6	1.00		HUR
1974 04 14.86	7.6		10.0	B		14			0.23		AER
1974 04 14.86	7.1		8.0	B		11	3.0	6	0.40	30	PAN
1974 04 14.86	7.3		3.0	B		8					BRE
1974 04 14.87	7.0		16	L		50	3.0		0.25		LEM
1974 04 14.88	6.9		5.0	B		20	4		0.33	25	BRO01
1974 04 14.88	6.8		5.0	B		10	6.5	6	0.33		DOH
1974 04 14.89	7.5		5.0	B		7	4.5	6	0.18	30	STU
1974 04 14.89	6.2	H	5.0	B		7	3.0		0.33	55	HOW
1974 04 14.89	7.0	T	5.0	B		10			0.50		PAC
1974 04 14.90	6.6		8.0	B		10		7	0.23		ROG
1974 04 14.90	6.3		5.0	B		7			0.50		GAI
1974 04 14.90	7.1	S	4.0	B		8			0.17		BUR
1974 04 14.90	6.7		5.0	B		7	2.0	5	0.33		SHA02
1974 04 14.92			7.0	R		10			0.50		FRY
1974 04 14.92	7.5		7.5	R		62	3.0		0.13	5	POT
1974 04 15.12	7.6		10.0	B		14			0.23		AER
1974 04 15.90	7.2		6	R		17	1.0		0.25		SHA02
1974 04 15.91	7.5		6.0	B		13		7	1.00	40	HEN
1974 04 15.91	7.2		5.0	B		10	6.0	6	0.25		DOH
1974 04 16.87	7.3		16	L		50	3.0	7	0.25		LEM
1974 04 16.88	7.9		10.0	B		14			0.22		AER
1974 04 16.88	7.5		25.4	L		48	5.3	6	0.25		DOH
1974 04 16.88	7.4		3.0	B		8					GLY
1974 04 16.88	7.5		45	L		120					PAC
1974 04 17.13	7.9		10.0	B		14			0.22		AER
1974 04 17.30	6.9	O	5.0	B		10	2.6	5	2.33	35	BOR
1974 04 17.88	7.9		10.0	B		14			0.20		AER
1974 04 18.06	7.0	O	5.0	B		10	4.2	5	1.50	60	BOR
1974 04 18.15	7.0		25.4	L	5	120		5	0.50	40	BRY
1974 04 18.87	7.6		16	L		50	2.5	5	0.25		LEM
1974 04 19.87	8.0		16	L		50	2.0	5	0.25		LEM
1974 04 19.89	7.7	S	11.5	R	15	70	2.0	6	0.03	35	RID
1974 04 19.90	7.5	S	5.0	B		7					HOW
1974 04 20.02	7.5		7.0	R		10					FRY
1974 04 20.15	7.0	O	5.0	B		10	3.6	4	1.17	40	BOR
1974 04 20.90	7.9	S	11.5	R	15	70	2.0	5	0.03	35	RID
1974 04 21.07	7.4	O	5.0	B		10	4.4	4	0.83	40	BOR
1974 04 21.13	7.1		25.4	L	5	120		4	0.50	40	BRY
1974 04 21.88	8.5		21	L		35	2.0	5	0.08	35	GAI
1974 04 21.88	7.8		8.0	B		11	6.0	5	0.27	35	PAN
1974 04 21.89	8.5		5.0	B		20			0.17		BRO01
1974 04 21.90	7.9		8.0	B		10		6	0.15	40	ROG

Comet Bradfield (1974 III = 1974b) Cont.

DATE (UT)	MAG.	R	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1974 04 21.90	7.5	V	4.0	B		8		7	0.50		BUR
1974 04 21.90	7.9		8.0	B		10		6	0.67		SHA02
1974 04 21.90	7.9	S	30	L		96	3.0	5	0.17	50	HOW
1974 04 21.90	7.8		8.0	B		10	4.0		0.75		GRI
1974 04 21.92	7.9	S	5.0	B		10			1.00	30	HUR
1974 04 21.99	7.8		7.0	R		10					FRY
1974 04 22.02	8.3	S	11.5	R	15	70	1.5	6	0.03	20	RID
1974 04 22.88	8.6		10.0	B		14			0.15		AER
1974 04 22.88	8.4	S	11.5	R	15	70	1.5	7	0.03	20	RID
1974 04 22.93	8.0		7.0	R		10					FRY
1974 04 23.04	7.7	S	5.0	B		10	10		0.50	25	HUR
1974 04 23.87	8.6		16	L		50	2.0	5	0.13		LEM
1974 04 23.89	8.5		6.0	B		13	2.0	7	0.25	40	HEN
1974 04 23.90	8.1	V	8.0	B		10					GRI
1974 04 23.90	8.1		20	R		40	2.0	6	0.25		SHA02
1974 04 23.90	7.9	V	8.0	B		10			0.17	40	ROG
1974 04 23.92	8.5		7.0	R		10					FRY
1974 04 23.93	8.9		5.0	B		20	3.5		0.25	25	BRO01
1974 04 23.93	8.5	S	11.5	R	15	70	1.5	6			RID
1974 04 24.88	8.8		10.0	B		14			0.13		AER
1974 04 24.89	8.4	S	11.5	R	15	70	1.5	6	0.05	20	RID
1974 04 24.99	7.9		25.4	L		48	4.0	6	0.25		DOH
1974 04 25.08	8.8		10.0	B		14			0.13		AER
1974 04 25.92	8.7	S	11.5	R	15	70	1.5	6	0.05	15	RID
1974 04 25.94	8.0		5.0	B		10					PAC
1974 04 25.96	8.0		25.4	L		48	3.5	6	0.25		DOH
1974 04 26.07	7.0	O	5.0	B		10	5.5	5	1.50	45	BOR
1974 04 26.89	8.4	S	26	L		40	3.0		0.12	40	HUR
1974 04 26.90	9.0	T	21	L		35	2.0	5	0.10	50	GAI
1974 04 26.90	8.8		20	R		40	2.0		0.17	40	ROG
1974 04 26.90	8.2		20	R		40	1.5	6	0.17		SHA02
1974 04 26.92	8.6	S	11.5	R	15	70	1.0	5	0.03	20	RID
1974 04 26.95	8.2		25.4	L		48	4.0	6	0.20		DOH
1974 04 26.97	9.0		5.0	B		20	4.0		0.25	25	BRO01
1974 04 27.02	7.6		15	L		48	4	5	0.07		STU
1974 04 27.30	7.5	O	5.0	B		10	4.8	4	1.33	40	BOR
1974 04 28.34	7.6	O	5.0	B		10	4.4	4	0.67	50	BOR
1974 04 28.91	9.7	S	26	L		40	2.0	5	0.02	30	HUR
1974 04 29.92	9.0	S	11.5	R	15	70	1.0	5			RID
1974 04 29.99	8.7		25.4	L		48	2.5	4			DOH
1974 04 30.31	8.0	O	5.0	B		10	3.2	5	0.58	40	BOR
1974 04 30.87	9.7	S	26	L		80	1.0		0.03	50	HUR
1974 04 30.90	9.2		20	R		40	1.5				ROG
1974 04 30.90	9.2	S	5.0	B		7					CLA01
1974 04 30.90	8.9	S	11.5	R	15	70	1.0				RID
1974 04 30.90	9.2		20	R		40	1.0				SHA02
1974 04 30.90	9.1		20	R		40					GRI
1974 04 30.90	9.2	S	20	R		40					BUR
1974 04 30.93	9.5		20	L		27	6.0	5			PAN
1974 04 30.97	8.5		25.4	L		48	2.5	5	0.13		DOH
1974 05 01.88	8.8	$	15	L		50	5				GAV

Comet Bradfield (1974 III = 1974b) Cont.

DATE (UT)	MAG.	R	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1974 05 01.89	9.2	S	11.5	R	15	70	1.0	6			RID
1974 05 01.90	9.3	S	20	R		40	2.0	7	0.08	0	SHA02
1974 05 01.92	8.8	S	30	L		96	3.0	6	0.17	45	HOW
1974 05 02.33	7.9	O	5.0	B		10	3.4	5	0.58	38	BOR
1974 05 06.80	9.3	S	30	L		96	2.0	5			HOW
1974 05 06.88	9.3	S	11.5	R	15	70	1.5	6			RID
1974 05 07.00	9.7	S	20	R		120	1.0	6			SHA02
1974 05 07.89	8.3		22	L		54	1.5	6	0.13		LEM
1974 05 07.90	9.1	S	20	R		40	5.0	7			SHA02
1974 05 07.92	8.0		20	L		27	4.0	5	0.13	50	PAN
1974 05 08.08	7.8	O	5.0	B		10	2.7	4	0.50	46	BOR
1974 05 08.90	9.2	S	11.5	R	15	70	1.0	6			RID
1974 05 08.92	8.9	S	30	L		96	1.5	5		40	HOW
1974 05 09.09	7.9	O	5.0	B		10	4.7	3	0.58	44	BOR
1974 05 10.90	9.1	S	20	R		40	3.0	5			SHA02
1974 05 10.90	8.8	S	30	L		96	5.0	5	0.33	35	HOW
1974 05 10.90	9.0	S	20	R		40					BUR
1974 05 10.90	9.0		25.4	L		48	2.5	5	0.09		DOH
1974 05 10.91	9.3		22	L		54	1.5	5			LEM
1974 05 10.91	9.2	S	5.0	R		50					MIL01
1974 05 10.93	9.7		10.0	B		14			0.12		AER
1974 05 10.93	9.1		15	L		24	5	3	0.17		STU
1974 05 11.03			21.6	L		56	5.0		0.33	25	BRO01
1974 05 11.04	9.3		7.0	B		12			0.22		VER01
1974 05 11.07	9.7		10.0	B		14			0.12		AER
1974 05 11.90	9.3	S	11.5	R	15	70	1.0	5			RID
1974 05 11.95	9.1		15	L		24	4	4	0.13	15	STU
1974 05 12.02			21.6	L		56	4.0	4	0.17	25	BRO01
1974 05 12.02	9.0		25.4	L		48	2	7			DOH
1974 05 12.02	9.7		10.0	B		14			0.12		AER
1974 05 12.08	8.1	O	5.0	B		10	5.2	4	0.67	55	BOR
1974 05 12.91	9.4		22	L		54	1.5	5	0.13		LEM
1974 05 12.94	9.3	S	11.5	R	15	70	1.0	5			RID
1974 05 12.95	9.5		15	L	8	96	1.5	5			LEW
1974 05 13.90	9.1	S	30	L		96	4.0	5			HOW
1974 05 13.91	9.5		22	L		54	1.5	5	0.13		LEM
1974 05 13.91	9.3	S	11.5	R	15	70	1.0	5			RID
1974 05 13.93	9.3		25.4	L		48	2	7			DOH
1974 05 13.95	9.6		15	L	8	96	1.5	5			LEW
1974 05 13.96	9.3	S	26	L		40	3.0		0.08		HUR
1974 05 14.08	8.0	O	5.0	B		10	9.0	5	0.67	85	BOR
1974 05 14.82	9.3	S	11.5	R	15	70	1.5	5	0.05		RID
1974 05 14.90	9.1	S	30	L		96	4.0	5	0.17	105	HOW
1974 05 14.90	9.4	S	20	R		40	1.0	5	0.07	15	SHA02
1974 05 14.90	9.1	S	20	R		40					BUR
1974 05 14.91	9.3		22	L		54	2.0	5	0.25		LEM
1974 05 14.93	8.7		8.0	B		11	5.0	3			PAN
1974 05 14.97	9.0		25.4	L		48	2.5	5			DOH
1974 05 15.08	8.2	O	5.0	B		10	4.5	4	0.33	123	BOR
1974 05 15.08	9.2	N	32	L		44					BOR
1974 05 15.90	9.2	S	20	R		40	4.0	4			SHA02

Comet Bradfield (1974 III = 1974b) Cont.

DATE (UT)	MAG.	R	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1974 05 15.95	9.5	P	10		4		1.0				HEN
1974 05 15.96	9.5		25.4	L		48	2.5	5			DOH
1974 05 17.90	9.3	S	30	L		96	3.5	4	0.13	140	HOW
1974 05 17.91	9.8		22	L		54	1.5	4	0.13		LEM
1974 05 17.92	9.1	S	11.5	R	15	70	1.5	5			RID
1974 05 17.96	9.1	S	26	L		40	4.0	6	0.08	130	HUR
1974 05 17.96	9.6		25.4	L		48	2	5			DOH
1974 05 18.00	9.5	S	20	R		40	2.0	3			SHA02
1974 05 18.92	9.5	S	11.5	R	15	70	1.0	5			RID
1974 05 18.94	9.1		8.0	B		11	6.0	3			PAN
1974 05 19.00	9.5	S	30	L		96	3.0	5	0.17	130	HOW
1974 05 19.09	9.4	N	32	L		55	2.3	4	0.42	200	BOR
1974 05 19.09	8.6	O	5.0	B		10	5.0				BOR
1974 05 19.09	9.5		15	L		48	3.5	3			STU
1974 05 19.90	9.2	S	20	R		40	2.0	3	0.05	180	SHA02
1974 05 19.92	9.4	S	11.5	R	15	70	1.0	4			RID
1974 05 19.93	8.8	S	26	L		40	2.0		0.05	155	HUR
1974 05 19.93	9.5	S	15	L		24	3.5				STU
1974 05 20.00	9.3		20	R		40					ROG
1974 05 20.10	9.8	N	32	L		55	2.3	4	0.67	217	BOR
1974 05 20.10	8.8	O	5.0	B		10	9.0				BOR
1974 05 20.99	9.9		25.4	L		48	2	5			DOH
1974 05 21.00	9.2	S	20	R		40	2.5	2			SHA02
1974 05 21.11	9.2	N	5.0	B		10	4.0				BOR
1974 05 21.11	9.8	N	32	L		55	1.2	3	0.5	200	BOR
1974 05 21.98	9.3		8.0	B		11	8.0	3			PAN
1974 05 22.00	9.1	S	20	R		40	1.5	4	0.08	180	SHA02
1974 05 24.00	9.4:		20	R		40	2.0	3			SHA02
1974 05 24.09	9.4	S	32	L		55	2.8	3	0.33	195	BOR
1974 05 24.09	9.0		5.0	B		10	6.3				BOR
1974 05 24.95	10.3		22	L		54	2.0	4			LEM
1974 05 25.10	10.1	B	30	L		96	2.0	4	0.07	140	HOW
1974 05 25.90	9.6:		20	R		40	2.0	3			SHA02
1974 05 26.10	10.4	B	30	L		96	4.0	3			HOW
1974 05 26.90	9.5		20	R		40	2.5	4			ROG
1974 05 26.90	9.8	S	20	R		40	3.0	2			SHA02
1974 05 26.95	9.5	S	15	L		48	3.5	3			STU
1974 05 27.11	9.8	S	32	L	6	55	2.0	2			BOR
1974 05 29.96	10.0:		11.5	R	15	70	1.0	2			RID
1974 05 30.00	9.8	B	30	L		96	5.0	3			HOW
1974 05 30.00			20	R		40	2.0	2			SHA02
1974 05 30.05	9.8		12.5	L		25	9.0	2			PAN
1974 06 02.02	10.5		15	L		48	3.0	2			STU
1974 06 05.04	10.4	B	30	L		96	4.0	1			HOW
1974 06 09.94	11.5:		26	L		80	1.5	1			HUR
1974 06 09.98	11.5:		25.4	L		96	1.5	1			DOH
1974 06 12.00	11.0		30	L		96	3.5	3			HOW
1974 06 12.15	10.7	A	32	L	6	55	2.8	2	0.13	205	BOR
1974 06 13.10	10.7	A	32	L	6	55	2.8	2	0.06	200	BOR
1974 06 14.00	11.0:		30	L		96	2.5	1			HOW
1974 06 14.00	12.0:		25.4	L		96	1.0	1			DOH
1974 06 14.11	10.7	A	32	L	6	55	3.0	1	0.07	210	BOR

Comet Bradfield (1974 III = 1974b) Cont.

DATE (UT)	MAG.	R	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1974 06 19.11	10.8	A	32	L	6	55	2.4	1		220	BOR
1974 06 21.10	11.9		30	L		96	2.5	2			HOW
1974 07 09.10	12.4	A	32	L	6	88	1.2	0			BOR
1974 07 11.11	12.0	A	32	L	6	88	1.1	1			BOR
1974 07 12.10	12.1	A	32	L	6	88	1.1	0			BOR
1974 07 13.11	12.4	A	32	L	6	88	1.1	0			BOR
1974 07 17.12	12.4	A	32	L	6	88	1.7	0			BOR
1974 07 20.16	12.4	A	32	L	6	88	1.6	0			BOR
1974 07 21.17	12.5	A	32	L	6	88	1.6	0			BOR
1974 07 22.11	12.5	A	32	L	6	88	1.0	0			BOR
1974 08 16.11	12.8	A	32	L	6	88	1.3	0			BOR

Comet Kobayashi-Berger-Milon (1975 IX = 1975h)

DATE (UT)	MAG.	R	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1975 08 03.13	4.5	S	5.0	B		7					SHE
1975 08 03.13			15	L	5	24	22	8	&1.75	90	SHE
1975 08 03.88	4.7	K	3.1	B		8					VAN01
1975 08 04.12	4.4	S	5.0	B		7					SHE
1975 08 04.12				E			&20		&1		SHE
1975 08 04.12			15	L	5	24	27	9/	&2.17	88	SHE
1975 08 04.15	4.3	S									GOO01
1975 08 04.9	4.4	K	5.0	B		7					COM
1975 08 05.16	4.4		5.0	B		7					SHE
1975 08 05.16			15	L	5	24				88	SHE
1975 08 06.0	4.4	K	5.0	B		7					COM
1975 08 06.12	4.2			E							SHE
1975 08 06.12	4.2		5.0	B		7					SHE
1975 08 06.12			15	L	5	24	22	9/	&2	72	SHE
1975 08 08.11			15	L	5	24	17	9/	&1.75	70	SHE
1975 08 08.11	4.2			E							SHE
1975 08 08.11	4.2		5.0	B		7					SHE
1975 08 08.9	5.1	K	4.0	R		10					COM
1975 08 09.12	4.5		5.0	B		7	18	9/	&1.5	65	SHE
1975 08 09.12	4.5			E							SHE
1975 08 09.14	5.0	Y	5.0	B		12		3/			GRE
1975 08 09.17	4.6	X	5.0	B		7					MEI01
1975 08 10.0	5.1	K	4.0	R		10					COM
1975 08 10.08	4.6	X	5.0	B		7					COL
1975 08 10.11	4.6		5.0	B		7	15	9	&0.75	60	SHE
1975 08 10.15	4.6	X	5.0	B		7			12		MEI01
1975 08 11.15	4.9	Y	5.0	B		12		3	&0.82		GRE
1975 08 11.16	5.1	Y	5.0	B		12			&0.82		GRE
1975 08 12.12	4.9	Y	5.0	B		12	11	4	&0.71		GRE
1975 08 13.13	4.4			E							SHE
1975 08 13.13			15	L	5	24	12		&0.75	58	SHE
1975 08 14.13	4.9	Y	5.0	B		12	&14	5/	&0.21		GRE
1975 08 16.17	4.7	Y	5.0	B		12		6		145	GRE
1975 08 17.15	4.7	Y	5.0	B		12				145	GRE
1975 08 23.08	5.2	S	15	L	5	24	5	9	0.23	42	SHE
1975 08 23.2	4.8	K	3.5	B		7					OHA

Comet Kobayashi-Berger-Milon (1975 IX = 1975h) Cont.

DATE (UT)	MAG.	R	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1975 08 25.07	5.1	S	15	L	5	24	5	9/	0.58	40	SHE
1975 08 26.05	4.8	Y	5.0	B		12		7/	3.5		GRE
1975 08 26.08	4.9	S	5.0	B		7					SHE
1975 08 26.08			15	L	5	24			&0.10	48	SHE
1975 08 26.08			15	L	5	24	7	9/	0.72	39	SHE
1975 08 30.06	4.7:Y		5.0	B		12		8/	&3		GRE
1975 08 31.04	5.0:Y		5.0	B		12					GRE
1975 10 08.69	7.2	S	4.5	R							JON
1975 10 16.68	8.0	S	4.5	R							JON
1975 11 02.86	10.1:S		20	L							BOE

Comet Kohler (1977 XIV = 1977m)

DATE (UT)	MAG.	R	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1977 09 17.85	9.8	S	8.0	B		20	5	2/			GLI
1977 10 01.82	9.1	S	17.5	L		37	4	2/			GLI
1977 10 10.77	7.8	S	8.0	B		20	6	3			GLI
1977 10 15.79	8.2	S	8.0	B		20	4	3/			GLI
1977 10 30.73	7.4	S	8.0	B		20	5	4	1.30	50	GLI
1977 11 04.80	6.7	S	8.0	B		20	3	4/		45	GLI
1977 11 05.80	6.7	S	8.0	B		20	5	4/			GLI
1977 11 06.72	6.8	S	8.0	B		20	5	4/	0.25		GLI
1977 11 13.81	6.6	S	8.0	B		20	4	4			GLI

Comet Meier (1978f)

DATE (UT)	MAG.	R	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1979 09 12.11	11.5		32	L			1.3				BOR
1979 09 13.14	11.4		32	L			1.1				BOR
1979 09 13.14	14	$	32	L		110					BOR
1979 09 15.11	11.6		32	L			1.3				BOR
1979 09 17.09	11.6		32	L			& 1.3				BOR
1979 09 20.09	11.5		32	L			1.3				BOR
1979 09 20.09	14	$	32	L		110					BOR

Comet Meier (1979i)

DATE (UT)	MAG.	R	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1979 09 24.86	11.8	V	26	L		80	1.5	4			HUR
1979 10 29.16	11.9		30	L			1.0		&0.05	0	KEI
1979 10 29.16	11.9		30	L	5	62	1.0	3/	0.05	360	KEI
1979 10 29.80	11.7		30	L	5	89					KEI
1979 10 31.77	11.7		30	L	5	89					KEI
1979 11 02.17	11.9		30	L			1.2		0.05	0	KEI
1979 11 02.17	11.9		30	L	5	89	1.2	5	0.05	360	KEI
1979 11 07.77	11.9		30	L	5	89	0.9	2			KEI
1979 11 07.77	11.9		30	L			0.9				KEI

Comet Meier (1979i) Cont.

DATE (UT)	MAG.	R	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1979 11 09.78	11.9		30	L	5	142	0.8	3			KEI
1979 11 10.76	13.5	P	10	R	5		0.7	3			HEN
1979 11 12.75	13.2	P	10	R	5		0.8	3			HEN
1979 11 12.77	12	:	30	L	5	89	1.5	2			KEI
1979 11 13.02	13.5	P	15	R	5		1.0	2			RID
1979 11 13.05	12.0		30	L			1.2				KEI
1979 11 13.05	12.0		30	L	5	89	1.2	2			KEI
1979 11 16.12	11.9		30	L			1.1				KEI
1979 11 16.82	11.9		30	L	5	89	1.1	3			KEI
1979 11 18.77	12	:	30	L	5	142		2			KEI
1979 11 20.12	12.1	:	30	L			1.8				KEI
1979 11 20.20	12.2		30	L	5	89	1.8	3			KEI
1979 11 29.20	12.6		30	L			1.3				KEI
1979 11 29.20	12.6		30	L	5	89	1.3	2			KEI
1979 12 16.44	13.2		30	L	5	89	1.4	2			KEI
1979 12 20.08	13.5		30	L	5	89	0.5	0			KEI
1980 01 13.84	14	:P	10	R	5		0.6	2			HEN

NOTE: On Nov. 20, Keitch observed an inner coma diameter of 0'.9, with a very weak outer coma to 1'.8. On Nov. 29, he saw 0'.7 and 1'.3, respectively.

Comet Bradfield (19791)

DATE (UT)	MAG.	R	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1979 12 26.74	5.4	K	5.0	B		10			1.5		TRE
1979 12 26.74			15	L		64	3				TRE
1979 12 27.72	5.5		5.0	B		7					BRY
1979 12 27.74			10	L		150	2				TRE
1979 12 27.74	5.4		20	C						315	PLE
1979 12 27.74	5.4	:K	5.0	B		10					TRE
1979 12 29.73	5.4	:K	5.0	B		10					TRE
1979 12 29.73			10	L		150	2.5				TRE
1980 01 01.74			10	L		150	3				TRE
1980 01 01.74	5.8	K	5.0	B		10					TRE
1980 01 06.74	6.2	K	5.0	B		10					TRE
1980 01 06.74			10	L		150	3.5				TRE
1980 01 07.74	6.0	K	10	L		150	4		0.08		TRE
1980 01 07.75	5.2	:	20	C		160			&0.25		DIE
1980 01 26.10	4.5		5.0	B		7	12				QUI
1980 01 29.75	6.5	S	5.0	B		7					BUS01
1980 01 30.11	5.5		5.0	B		7					QUI
1980 01 31.76	5.6	S	8.0	B		20	15	1			GLI
1980 02 01.75	6.5	S	5.0	B		7					BUS01
1980 02 01.76	6.6	S	5.0	B		7	&10				COM
1980 02 01.81	7.4	S	11	L		37					FEI
1980 02 02.01	6.2	A	3.5	B		7	14				MOR03
1980 02 03.00	6.0	A	3.5	B		7	15				MOR03
1980 02 03.10	6.3	:S	8.0	B		20					GRE
1980 02 03.12	6.3		5.0	B		7					QUI
1980 02 03.51	7.0	S	20.3	L		38	12	3			BOE
1980 02 03.73	6.0		3.0	B		8	7				FIL01

Comet Bradfield (19791) Cont.

DATE (UT)	MAG.	R	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1980 02 04.05	6.7	S	8.0	B		20	&18				GRE
1980 02 05.02	7.2	A	3.5	B		7	14				MOR03
1980 02 05.14	6.6		5.0	B		7					QUI
1980 02 05.50	7.3	S	20.3	L		38	12		0.08		BOE
1980 02 06.00	7.5	A	3.5	B		7	10				MOR03
1980 02 06.56	7.5	S	20.3	L		38	11				BOE
1980 02 06.74	6.3		15	L	5		4				FIL01
1980 02 07.10	7.7	A	3.5	B		7					MOR03
1980 02 07.55	7.7	S	20.3	L		38	10		0.05		BOE
1980 02 08.09	7.9	A	3.5	B		7	7				MOR03
1980 02 08.17	6.8		5.0	B		7					QUI
1980 02 08.74	6.6		15	L	5		5				FIL01
1980 02 08.84	7.7	S	8.0	B		20	9	1/			GLI
1980 02 09.06	7.8	A	3.5	B		7					MOR03
1980 02 09.48	7.9	S	20.3	L		38	9	5			BOE
1980 02 09.75	8.0:	A	10.0	B		14					DRU
1980 02 10.50	8.0	S	20.3	L		38	8	5	0.03		BOE
1980 02 10.76	8.1	A	7.6	R		40					VAN02
1980 02 10.79	8.0:	A	10.0	B		14					DRU
1980 02 10.80	8.0	A	5.0	B		7					COM
1980 02 11.17	8.3	M	12.5	R			5				QUI
1980 02 11.70	8.2	A	4.0	B		12					BUS01
1980 02 11.78	8.2	A	8.0	B		20					BOU
1980 02 12.70	8.4	A	4.0	B		12					FEI
1980 02 12.73	8.3	A	4.0	B		12					BUS01
1980 02 13.71	8.4	A	4.0	B		12					BUS01
1980 02 13.72	8.5	A	8.0	B		20					BOU
1980 02 13.73	8.5	A	4.0	B		12					FEI
1980 02 13.79	8.8	A	7.5	R		40					VAN02
1980 02 13.79	7.5		15	L	5						FIL01
1980 02 15.03	8.4	A	3.5	B		7					MOR03
1980 02 16.69	8.9	A	4.0	B		12					FEI
1980 02 16.73	9.0	A	8.0	B		20	&10				BOU
1980 02 17.58	8.8	S	20.3	L		38	8	5			BOE
1980 02 17.75	9.2	A	8.0	B		20					BOU
1980 02 18.75	9.4	A	8.0	B		20					BUS01
1980 02 18.76	9.3	A	8.0	B		20					BOU
1980 02 18.82	8.6	S	8.0	B		20	4	1			GLI
1980 02 18.92	10.5:	A	14.7	R		150	&10				COM
1980 02 19.53	8.9	S	20.3	L		38	7	5			BOE
1980 02 19.75	9.4	A	8.0	B		20					BOU
1980 02 19.79	8.7		15	L	5		3				FIL01
1980 02 19.89	8.6	S	8.0	B		20	6	1			GLI
1980 02 20.62	9.0	S	20.3	L		38	7	5			BOE
1980 02 20.81	9.0		15	L	5		2				FIL01
1980 02 21.62	9.0	S	20.3	L		38	7	5			BOE
1980 03 04.50	11.3	I	20.3	L		38	4	7			BOE
1980 03 08.49	11.8	I	20.3	L		38	6				BOE
1980 03 09.50	11.9	I	20.3	L		38		9			BOE
1980 03 10.50	12.0	I	20.3	L		38		9			BOE

Periodic Comet Grigg-Skjellerup (1977 VI = 1977b)

DATE (UT)	MAG.	R	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1977 04 16.74	9.8		12	R		20	8				YAN
1977 04 16.74	10.5		12	L		33	3	1/			SAK
1977 04 16.75	9.8		15	L		23	8				MIT
1977 04 16.78	10.0		16	L		25	20				NAG02
1977 04 16.79	10 :		12	L		33	5	1/			SAK
1977 04 16.8	11 :		15	L							SEK01
1977 04 17.76	11.3:		10	L		50	5				SUN01
1977 04 17.80	11.5		20	L		40	1.5				NAK04
1977 04 18.78	11.5		21	L		50	4				YOS01
1977 04 18.78	10.5		12	L		33	6	1/			SAK
1977 04 18.78	11.3		20	L		40	3				NAK04
1977 04 18.78	10.0		15	L		23	8				MIT
1977 04 19.74	10.6		12	R		20	4				YAN
1977 04 19.76	10.5		15	L		26	3.5				WAS
1977 04 19.76	10.7		15	R		19	6	2			SAT02
1977 04 19.77	10.5		12	B		20	5				SEK
1977 04 19.78	10.8:		12	L		33	5	1/			SAK
1977 04 19.79	10.2		15	L		28	6				NAK04
1977 04 20.74	10.4		12	R		20	5				YAN
1977 04 20.75	10.5		15	L		23	6				MIT
1977 04 20.76	11.5		15	L		31	10				MAT04
1977 04 20.76	12.0		21	L		50	4				YOS01
1977 04 20.77	10.3:		12	L		33	& 4.5	1			SAK
1977 04 20.78	10.5		15	L		28	8				NAK04
1977 04 21.75	10.8		12	L		20	3				YAN
1977 04 21.75	10.5		15	L		26	4				WAS
1977 04 21.76	11.0		15	R		19	6	1			SUN
1977 04 21.77	11.2		18	L		26	4				KAJ
1977 04 21.78	11 :		15	L		31	13				MAT04
1977 04 21.78	11 :		12	L		33	5	1			SAK
1977 04 21.79	10.5		15	L		38	7				NAK04
1977 04 25.75	11		15	L		23	4				MIT
1977 04 28.74	11.0		12	R		20	3/				YAN
1977 04 28.76	12.0		21	L		50	5				YOS01
1977 04 29.72	11.3		10	L		25	4				NAG01
1977 04 29.73	11.3		10	L		25					UCH
1977 04 29.73	11.0		10	L		25					SAT01
1977 04 29.73	11.4		10	L		25	3/				KIK
1977 04 29.74	11.5		10	L		25					HAS01
1977 04 29.75	11.0		12	R		20	3				YAN
1977 04 30.76	11.3		10	L		25					UCH
1977 04 30.76	11.3:		10	L		25					SUN

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NEW ADDITIONS TO THE REFERENCE KEY (cf. ICQ, Vol. 2, pages 6, 39):
B = Bonn Durchmusterung (Argelander)
I = Atlas Stellarium

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UNIVERSAL TIME (UT): This time based on the Greenwich meridian is used throughout the ICQ; it is 24-hour time, from midnight to midnight. In North America, add the following numbers to standard times to convert to UT: EST, 5; CST, 6; MST, 7; PST, 8. For daylight savings time, add 4, 5, 6, and 7 hours, respectively.

P/STEPHAN-OTERMA 1980g (Continued from page 45)

H_o = 1.66 ± 0.48 (p.e.)
n = 15.48 ± 0.86 (p.e.),

so that the magnitude formula is

$$H = 1.66 + 5 \log \Delta + 38.71 \log r$$

where H_o is the comet's absolute magnitude, H is the observed magnitude, and Δ and r are the comet's geocentric and heliocentric distances, respectively.

The results of the analysis suggest that P/Stephan-Oterma is an intrinsically-bright comet. Such a conclusion is a bit misleading, since H_o is related to n, and n is unusually large for this comet; in fact, it is over four times larger than the n-value (3.32) found by Bobrovnikoff (1941). It should be noted that the magnitude formula from van Biesbroeck's observations is intended only for r = 1.67 - 1.60 - 1.87.

***

OUTLOOK FOR THE 1980 APPARITION. Comet magnitude prediction is at best a risky proposition. However, using the results presented in this paper, we project the probable total magnitude of P/Stephan-Oterma during its 1980/1 return. Within 1.9 AU, it should follow the above magnitude formula; little is know about the preperihelion variation in brightness, and it will be assumed to follow the same formula. The ephemeris on p. 41 includes the predicted total visual magnitudes for September 1980 to February 1981, for an instrument of standard aperture (6.78 cm). The comet should become bright enough to be observable in moderate-aperture instruments by mid-September; its brightness should increase to near 8th magnitude in December, a reasonable assumption based upon the analysis of the 1942 data and upon the 1867 descriptions of the comet. In 1862 the comet was probably at least 9th magnitude; however, it was considerably further from the earth than it will be during the present apparition. This difference in geocentric distance should account for more than one magnitude in brightness. Even with all the evidence pointing to an 8th-magnitude comet in December, one must still remember that the predicted magnitudes could be off by more than a magnitude.

There may well also be an observable tail, as was noted in both of the previous apparitions. Van Biesbroeck (1943a) noted suggestions of a tail as early as November 11 of the 1942 return; he noted a "fan-shaped coma" and "a much fainter extension into 255 degrees making a very diffuse tail about 12' long." The fan-shaped coma was also seen by

(Continued on next page)

TABLE I.
Observational Data from the 1942/3 Apparition of P/Stephan-Oterma*

Date (UT) 1942/3	H	Delta	r	H*	log r
Nov. 11	10.6	0.708	1.666	10.33	0.222
13	10.6	0.697	1.659	10.36	0.220
14	10.5	0.692	1.655	10.28	0.219
18	10.5	0.673	1.643	10.34	0.216
27	10.2	0.643	1.619	10.14	0.209
Dec. 2	10.0	0.634	1.610	9.97	0.207
3	9.7	0.633	1.608	9.67	0.206
5	9.3	0.631	1.605	9.28	0.205
13	9.2	0.635	1.597	9.17	0.203
14	9.2	0.637	1.597	9.16	0.203
Jan. 6	10	0.729	1.611	9.67	0.207
12	10	0.770	1.624	9.55	0.211
26	11	0.887	1.665	10.24	0.221
27	11	0.897	1.669	10.22	0.222
Feb. 7	11.5	1.009	1.714	10.46	0.234
27	13	1.250	1.818	11.50	0.260
Mar. 8	14	1.373	1.873	12.29	0.273
31	15	1.718	2.029	13.82	0.307
Apr. 9	15.5	1.868	2.097	14.14	0.322
May 2	17	2.260	2.275	15.23	0.357

All observations made by G. van Biesbroeck with a 24-inch reflector at Yerkes Obs. The estimates of Mar. 31, Apr. 9, and May 2 are likely photographic magnitudes, and these were not aperture-corrected. H is the observed magnitude, H is the heliocentric magnitude (corrected to standard aperture), and Delta and r are the comet's geocentric and heliocentric distances, respectively.

P/STEPHAN-OTERMA 1980g (Continued from page 60)

him on Jan. 26-7 and on April 9.

Full moon occurs on 1980 Oct. 23, Nov. 22, and Dec. 21, making observation of P/Stephan-Oterma difficult near these dates; moon will be only 1 day past full when it passes some 5 degrees from the comet on November 23. This return is definitely a most favorable one for northern hemisphere observers.

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RECENT NEWS CONCERNING COMETS (Continued from page 42)

a manner such that the perihelion distance decreased from 4.2 to 2.3 AU, the eccentricity changed from a nearly-circular 0.12 to 0.37, and the period changed dramatically from 10.3 to 6.9 years!

Comet 1980d came to within 1.6 AU of the earth during mid-April, and was scheduled to fade very slowly as its geocentric distance increased during this summer. Perihelion will occur on 1980 Oct. 5.

Carlos Torres discovered a 15th magnitude diffuse comet on exposures made June 13 and 14 at the Cerro el Roble Station of the University of Chile. Comet Torres 1980e had some visible condensation and a tail less than 1 degree long at the time of discovery, and during June it moved slowly northwestward in southern Sagittarius.

Hans-Emil Schuster, observing from the European Southern Observatory at La Silla, recovered P/Comet Brooks 2 as an object of approximate magnitude 19 on June 13; it was designated comet 1980f, since it was the sixth comet to have been discovered or recovered this year.

Schuster also recovered P/Comet Stephan-Oterma (1980g) on exposures taken June 13 and 19. This comet is scheduled to come within the reach of small telescopes later this year; more information can be found on p. 43 of this issue, and an ephemeris is on the cover.

G. Auner, J. Dengel, and R. Weinberger of the Institut fuer Astronomie at Innsbruck, Austria, found images of an unidentified 19.5-magnitude comet on Palomar Sky Survey prints No. 1388, taken April 15, 1955 (cf. IAUC 3481).

--Daniel Green, 1980 July 20

PHOTOMETRIC PARAMETERS OF COMETS

A regular column by Charles S. Morris, Prospect Hill Observatory

Recently, in one of my more-relaxed moments, I began to ponder all the factors which, when combined, result in an estimate of a comet's brightness. The list is surprisingly long, and is presented below. I decided to publish this list here because it is important for both observers and for those who utilize comet magnitude data to be aware of the factors influencing the estimates. Given that a comet is of a specific spectral distribution and brightness as observed from earth, the following factors must be considered:

* Comet's observed coma diameter
* Comet's observed degree of condensation.
* Comparison stars and their spectral types
* Source/reference of comparison star magnitude values
* Magnitude estimation method used (Bobrovnikoff, In-Out, etc.)
* Instrument type, aperture, focal ratio, magnification
* Comet's altitude above horizon
* Comet's altitude relative to comparison stars
* Observing conditions: amount of artificial light present
* Observing conditions: twilight, moonlight, nearby bright stars, aurorae, etc.
* Observing conditions: meteorological (haze, fog, etc.)
* Observer's experience
* Spectral response of observer's eyes.

In all, I find at least 13 different factors which may influence a comet magnitude estimate. At least half of these factors change with time. Therefore, it should not be surprising that comet light curves generally show a considerable scatter of data. It is encouraging to note, however, that when care is taken to observe in dark skies, and to use uniform methods and appropriate instruments, it is possible for observers to minimize observational scatter.

(The author acknowledges the helpful suggestions of D. Green in preparing the above list.)

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AN EPHEMERIS AND MAGNITUDE ANALYSIS OF P/COMET TUTTLE FOR 1980/1

by Daniel W. E. Green

ABSTRACT. P/Comet Tuttle 1980h should become a binocular object in late 1980; a least-squares solution based upon observations made in 1967 by members of the A.L.P.O. yields $H = 8.5 + 5 \log \Delta + 19.6 \log r$, where H is the observed magnitude, and Δ and r are the geocentric and heliocentric distances. An ephemeris and orbital elements are given from a differential correction of two 1980 observations.

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Horace P. Tuttle discovered a comet at Harvard College Observatory on January 4, 1858 (Vsekhsvyatskii, 1964); this object was found to be the same comet which Mechain observed from France in 1790. Having a 13.8-year period, P/Tuttle has been observed during every return since 1858, with the exception of the 1953 return.

C.-Y. Shao and G. Schwartz recovered P/Tuttle on plates taken 1980 July 14 and 18 with the 1.55-m reflector at Harvard College Observatory's Agassiz Station, noting a magnitude of 19.5 to 20. These two observations were used by the author in connection with an orbit from Marsden (1980) to obtain the elements in Table II following a differential correction; residuals are equal to or less than 1.7 seconds of arc. The elements in Table II were used to compute the ephemeris in

(Continued on next page)

AN EPHEMERIS AND MAGNITUDE ANALYSIS OF P/COMET TUTTLE FOR 1980/1

(Continued from page 62)

Table IV.

As can be seen from Table IV, the comet passes quite close to the earth in late 1980, and this comet will likely become the brightest one of the year. Magnitude estimates from previous apparitions of comet 1980h are scarce, and little data was available for magnitude analysis. This author used 11 observations made by members of the Comet Section of the Association of Lunar and Planetary Observers (A.L.P.O.) (Milon 1968) from the 1967 return of P/Tuttle to compute a magnitude formula of the form

$$H = H_0 + 5 \log \Delta + 2.5n \log r,$$

where H is the observed magnitude (corrected to standard aperture; cf. Morris 1973), H_0 is the absolute magnitude, n is a parameter which determines how the comet's brightness varies with heliocentric distance, and Δ and r are the comet's geocentric and heliocentric distances, respectively.

Of the observations used in Table I, observations 1, 2, 7, 9, 10, 11, 13, and 15 were used to find $H_0 = 8.5$ and $n = 7.8$ using a least squares fit; the resulting magnitude formula was used for the predicted magnitudes in the ephemeris in Table IV. This analysis predicts a maximum magnitude of 7.2 in December, and is the most conservative of the four formulae presented in this paper. Observations 7, 9, 10, 11, 13, and 15 were used in the second analysis (see column II in Table III); they yield the values $H_0 = 8.1$ and $n = 11.6$. Observations 1, 7, 9, 10, 11, and 13 (column III in Table III) yield $H_0 = 8.5$ and $n = 8.6$.

For comparison, Richter (1942) found $H_0 = 7.7$ and $n = 16$ from observations made during the 1939 return of P/Tuttle; values from his formula are presented in column "R" of Table III. (All of the A.L.P.O. observations were aperture-corrected to 2.67 inches [Morris, 1973].) Accurate magnitude estimates of P/Tuttle during the present return could be very valuable in the study of comet nuclear decay.

TABLE I. VISUAL MAGNITUDE ESTIMATES FROM THE 1967 RETURN

	1967 Date (UT)	Magn.	Observer
1)	Feb. 9.50	11.5	Boethin
2)	11.02	11.0	Simmons
3)	15.01	12.8	Simmons
4)	16.04	12.5	Simmons
5)	18.06	11.8	Simmons
6)	26.07	12.5:	Simmons
7)	Mar. 1.08	10.3	Middlebroo
8)	2.04	12.0	Simmons
9)	2.08	10.3	Middlebroo
10)	3.08	10.5	Middlebroo
11)	7.08	10	Middlebroo
12)	11.02	10.7	Simmons
13)	11.12	10.0	McCants, Well
14)	12.07	<13	Simmons
15)	Apr. 24.07	9.9	Simmons

NOTE: All observations above were made with an 8-inch reflector, except for that by McCants and Wells (10-inch reflector).

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TABLE II. ORBITAL ELEMENTS FOR COMET 1980h (EQUINOX 1950.0)

T	=	1980 Dec. 14.7146
OMEGA	=	206°.8940
BIGOM	=	269°.8816
INCL.	=	54°.4622
Q	=	1.014941 AU
ECCEN.	=	0.822579
A	=	5.720539 AU
N°	=	0.072036
PERIOD	=	13.682184 years

TABLE III. PREDICTED TOTAL MAGNITUDES FOR P/TUTTLE 1980h

Date ET			I	II	III	R
1980	Oct.	8	11.9	13.0	15.5	14.3
		28	10.1	10.6	11.8	11.2
	Nov.	17	8.1	8.1	8.2	8.2
	Dec.	7	7.2	6.8	6.2	6.6
		27	8.0	7.7	7.1	7.4
1981	Jan.	16	9.4	9.5	9.8	9.7

TABLE IV.
EPHEMERIS FOR P/TUTTLE 1980h, MAGNITUDE = 8.5 + 5 log Δ + 19.6 log r

Date	ET	R. A. (1950)	Decl.	Delta	r	Elong.	Mag.
1980	09 28	08 17.35	+64 07.2	1.359	1.527	79.0	12.8
1980	10 08	08 53.46	+60 07.2				
1980	10 18	09 22.94	+54 46.8	1.031	1.334	82.3	11.0
1980	10 28	09 46.98	+47 31.1				
1980	11 02	09 57.38	+42 50.8	0.789	1.205	84.3	9.6
1980	11 07	10 06.91	+37 13.1				
1980	11 12	10 15.75	+30 22.5	0.644	1.132	84.9	8.6
1980	11 17	10 24.07	+22 02.0				
1980	11 22	10 32.11	+11 59.8	0.533	1.074	84.2	7.7
1980	11 24	10 35.30	+07 30.6				
1980	11 26	10 38.49	+02 47.1	0.505	1.055	83.4	7.5
1980	11 28	10 41.70	-02 08.5				
1980	11 30	10 44.95	-07 12.8	0.489	1.040	82.2	7.3
1980	12 02	10 48.25	-12 21.9				
1980	12 04	10 51.62	-17 31.4	0.488	1.028	80.9	7.2
1980	12 06	10 55.08	-22 37.0				
1980	12 08	10 58.65	-27 34.4	0.500	1.020	79.5	7.2
1980	12 10	11 02.33	-32 20.4				
1980	12 12	11 06.17	-36 52.2	0.525	1.016	78.1	7.2
1980	12 14	11 10.17	-41 08.1				
1980	12 16	11 14.37	-45 07.3	0.560	1.015	76.8	7.4
1980	12 18	11 18.79	-48 49.4				
1980	12 20	11 23.45	-52 14.8	0.602	1.018	75.6	7.6
1980	12 22	11 28.40	-55 24.3				
1980	12 27	11 42.24	-62 14.2	0.690	1.033	73.9	8.0
1981	01 01	11 58.68	-67 46.2				
1981	01 06	12 18.53	-72 14.9	0.825	1.071	72.1	8.7
1981	01 11	12 42.95	-75 52.2				
1981	01 16	13 13.47	-78 46.3	0.958	1.129	71.1	9.4
1981	01 21	13 51.99	-81 02.7				
1981	01 26	14 40.16	-82 44.9	1.080	1.201	71.0	10.2
1981	01 31	15 37.81	-83 55.0				
1981	02 05	16 41.01	-84 36.1	1.185	1.285	71.9	11.0

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CORRIGENDUM: In the April 1980 issue, top of page 24, column 2, FOR west-southwest READ east-southeast.

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