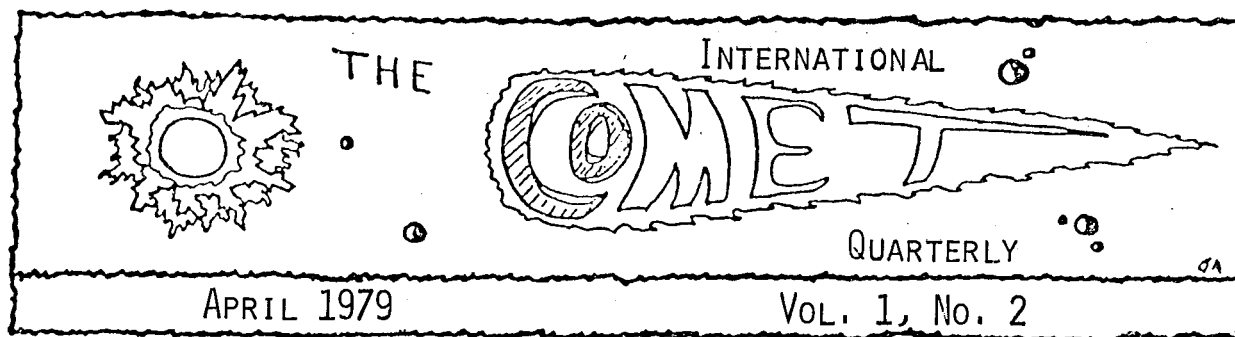




COMÉTOGRAPHIE ou TRAITÉ HISTORIQUE ET THÉORIQUE DES COMÈTES.

L. M. PINGRÉ, Chaire Régulière de Bibliothèque de St. Germain, Chancelier de l'Université de Paris, de l'Académie Royale des Sciences.

Verzeichniß der Elemente
der bisher berechneten

Cometenbahnen

Anmerkungen und Literatur-Nachweisen
neu bearbeitet, ergänzt und fortgesetzt
bis zum Jahre 1894

Dr. J. G. Galle

NOTULUM COMETARUM IN ORBE PARABOLICO ELEMENTA ASTRONOMIC.											
Comet Anni.	Idus Afrod.	Idus Orbi.	Perihelion.	Distantia Perihelion a Sole.	Excentricitas Orbitae p. Relativa a Sole.	Longitudo Mean Jovis Distantia.	Temp. Apog. Perihel.	Perihel. a Sole.	Perihel. a Sole.	Perihel. a Sole.	Perihel. a Sole.
1337	II 24 21	0	33 11	0	40666	9 602136	0 546374	Janu 2	6 15	46 11	0
1472	VI 11 46	10	5 20	0							
1531	II 19 25	0	17 56	0							
1532	II 20 17	0	32 36	0							
1556	III 31 43	0	33 6 30								
1577	V 25 52	0	74 31 41								
1580	V 18 57	30	04 49	0							
1581	II 7 43	30	6 4	0							

ASTRONOMICAL TABLES

WITH P R E C E P T S

BOTH IN
ENGLISH and LATIN

For computing the Places of the

SUN, MOON, PLANETS, and COMETS.

BY

EDMUND HALLET, L.L.D.

Late Regius Prof^{ss} of ASTRONOMY at Greenwich.

CATALOGUE OF COMETARY ORBITS EQUINOX 1950-0

INSIDE THIS ISSUE:

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- News of Recent Comets.....16
(Comets P/Tuttle-Giacobini-Kresak, P/Kowal, P/Daniel, P/Schwassmann-Wachmann I)
- Observations of Recent Comets...17
{Comets P/Schwassmann-Wachmann I (p. 24), P/Ashbrook-Jackson 1977g (p. 22), P/Arend-Rigaux 1977k (p. 20), P/Chernykh 1977l (p. 24), Kohler 1977m (p. 18), P/Comas Sola 1977n (p. 24), P/Wild 2 1978b (p. 21), Bradfield 1978c (p. 19), Meier 1978f (p. 19), P/Haneda-Campos 1978j (p. 20), P/Giclas 1978k (p. 23), Machholz 1978l (p. 20), Seargent 1978m (p. 20), P/Denning-Fujikawa 1978n (p. 23), and P/Tuttle-Giacobini-Kresak 1978r (p. 20)}

COMET CATALOGUES

THROUGH HISTORY

(See page 13)

PUBLICATIONS OF THE LASAN OBSERVATORY

Edited by Issai Yamamoto, Sc.D., Director,
Professor of Astronomy.

VOL. 1, NO. 4.

Preliminary General Catalogue of Comets

1979

1661
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65 APR. 28.00
68 FEB. 1.9467
72 MAY. 6.526
77 AUG. 27.085
80 DEC. 18.4476
82 SEP. 15.2807
83 JULY 1.2807

CENTRAL BUREAU FOR ASTRONOMICAL TELEGRAMS
INTERNATIONAL ASTRONOMICAL UNION



CATALOGUE OF COMETARY ORBITS

NEW ASTRONOMICAL OBSERVATORY
MANHATTAN, N.Y. 10019
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From the Editor

This issue inaugurates the use of computerized tabulation of physical cometary observations, as mentioned on page 4 of the January issue. Charles S. Morris, Associate Editor of the ICQ, is now collecting observations from observers around the world; some of these data have been put in machine-readable form, and the first example of the processing of these observations by a computer appears elsewhere in this issue. Comments concerning the present format are welcomed from readers.

Group subscriptions are now available for members of organizations; annual subscriptions entered in quantities of five or more at one time will be accepted at the rate of \$2.00 per subscription in North America (\$4.00 outside North America). Amounts on checks or money orders should be made payable to "The International Comet Quarterly" and sent to the Editor.

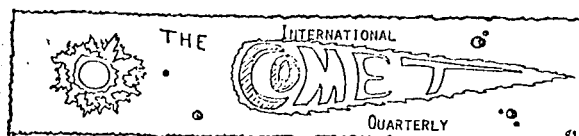
In addition to the cometary observations which are being published in the ICQ, articles are an integral part of the publication. Manuscripts pertaining to comets are welcome, and they should be sent to the Editor's address at right. Readers should note that the Editor will be at the following address from May 15, 1979, until August 25, 1979: Perkin 329; Smithsonian Astrophysical Observatory; 60 Garden St.; Cambridge, MA 02138 U.S.A.

Your Editor recently helped prepare the Third Edition of the CATALOGUE OF COMETARY ORBITS, edited by Brian G. Marsden. Copies of this 88-page publication, which contains comprehensive tabulations of the orbits of 1027 cometary apparitions observed up to the end of 1978, may be obtained from the

Central Bureau for Astronomical Telegrams, Smithsonian Astrophysical Observatory, 60 Garden St., Cambridge, MA 02138 U.S.A., for \$4.00 (\$6.00 airmail outside North America). An article about comet catalogues in general by Dr. Marsden appears on page 13 of this issue of the ICQ.

The July 1979 issue will be printed during the first week of July.

Daniel W. E. Green
Cambridge, Mass.
March 19, 1979



THE INTERNATIONAL COMET QUARTERLY is a non-profit journal devoted to news and observations of comets. Issues are published 4 times per year (January, April, July, and October); the ICQ is sponsored by the Physics Department of Appalachian State University, Boone, North Carolina. Subscriptions are \$3.00 per year (\$5.00 per year outside North America). Make checks payable to the ICQ and send to the Editor at 721 S. Elmwood Ave.; Oak Park, IL 60304 USA. All cometary observations should be sent to Charles S. Morris; Prospect Hill Rd.; Harvard, MA 01451 USA.

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Daniel W.E. Green.....Editor
Charles S. Morris.....Assoc. Editor
Thomas L. Rokoske.....Assoc. Editor
Brian G. Marsden...Editorial Advisor

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COMET CATALOGUES

by Brian G. Marsden

Almost two and three-quarters centuries have elapsed since Edmond Halley published the first catalogue of cometary orbits. That one-page document, incorporated in his famous work Synopsis of the Astronomy of Comets (Halley, 1705), contained orbital elements for 24 comets observed between 1337 and 1698. Halley calculated the orbits by means of a graphical method devised by Isaac Newton (1687), and, as is well known, Halley pointed out that three of the objects were in fact returns of one and the same comet that orbited the sun every 75 years.

As noted in the CQ for August 1978, the 25th comet for which an orbit was determined appears to have been that of 1723 (Bradley, 1724). Around 1740, several astronomers began calculating cometary orbits on a more-or-less routine basis, and a publication by Nicolaus Struyck (1753) includes a collection of another 24 orbits determined by this Dutch astronomer and others. The next complete comet catalogue was that of Thomas Barker (1757), an English astronomer whose name is frequently associated with the cubic equation that relates the time and the angle subtended at the sun by the arc from the perihelion point to the instantaneous position of a comet moving in a parabolic orbit.

The most complete account of cometary astronomy published in the 18th century was the celebrated Cométo-graphie of Alexandre Pingré (1783-84). This two-volume treatise represents what is even today the fullest and most accessible account of comets observed from the third millennium B.C. to the late-18th century A.D. Pingré determined the orbits of many comets, extending back to those of 837 and 1066 -- subsequently identi-

fied as early appearances of Halley's Comet (Hind, 1850) -- and the Cométographie includes a listing of the orbits of some 70 comets. Pingré's compilation was expanded to about 90 comets by Wilhelm Olbers (1797) in the latter's exposition of his method for calculating parabolic orbits.

The 18th-century comet catalogues normally gave a consecutive number, the time of the comet's perihelion passage (nowadays denoted by T), the angles representing the longitudes of perihelion and the ascending node ($\tilde{\omega}$ and Ω) and the orbital inclination to the ecliptic (i), and the perihelion distance in AU (q). The consecutive number was usually a Roman numeral, except that if a comet was known or suspected to have reappeared, the entries at the subsequent returns were listed under the Arabic numeral corresponding to the Roman numeral of the first appearance. The perihelion time T was by convention given in Paris Mean Time, Halley's Greenwich-Time figures having been adjusted by +10 minutes exactly. The inclination i was represented by an angle of less than 90° , with the notation D or R according as to whether the sense of the

ଉତ୍ତରାଞ୍ଚଳ ଉପକଣ୍ଠ

We are very happy to announce that Dr. Marsden has agreed to join the staff of the ICQ as Editorial Advisor. Director of the IAU Central Bureau for Astronomical Telegrams since 1968 and of the IAU Minor Planet Center since 1978, he is the leading authority on cometary orbits alive today. He is currently (1976-79) also President of the IAU Commission on Positions and Motions of Minor Planets, Comets and Satellites -- and an avid supporter of the aims of the ICQ.

(b) (7)(C), (b) (7)(D)

motion about the sun was direct or retrograde: nowadays, the custom is to permit i to have any value up to 180° , a retrograde value being denoted by the supplementary angle. The perihelion distance q was frequently given in terms of its common logarithm, and there was generally also a column for the "mean daily motion": the latter was simply a number proportional to $q^{-3/2}$, and it should not be confused with what is nowadays termed the mean daily motion (n), which in an elliptical orbit is simply the average angular velocity.

By the 1770s some orbit computers, notably Anders Lexell in St. Petersburg, Russia, were finding it desirable -- sometimes even necessary -- to abandon the assumption that comet orbits were exactly parabolic. In the Pingré and Olbers catalogues, the additional information about the orbital semimajor axis (a) and revolution period (P) was included in the notes discussing each comet.

Early in the 19th century the Paris astronomer Johann Burckhardt, making use largely of ancient Chinese records of comets, was able to calculate orbits for comets that had appeared as long ago as the year 240 A.D., and this same researcher also noted several more comets with orbits that differed significantly from parabolas. Shortly afterward, near Gotha, Germany, Johann Franz Encke (1819) made the important identification of the comet that still has the shortest known period (3.3 years), and his suggestion that it would reappear in 1822 was the second successful such prediction. Olbers (1823) extended his earlier catalogue (to 125 entries), including for the first time a special column for the orbital eccentricity (e), and also one for the angle from perihelion to node; the latter quantity, now called the argument of peri-

helion ω and given by $\tilde{\omega} - \Omega$ for direct orbits and by $\Omega - \tilde{\omega}$ for retrograde, had in fact been included in Halley's original tabulation, except that Halley defined it as equal to whichever of $\tilde{\omega} - \Omega$ or $\Omega - \tilde{\omega}$ was in the range $0-180^\circ$. The new Olbers catalogue was also noteworthy in that it included for the first time remarks about the particular equinox to which the various sets of angular elements were referred.

The dominant name in 19th-century comet cataloguing, however, was that of Johann Gottfried Galle, who at the Berlin Observatory in 1846 became the first person knowingly to see the planet Neptune. His first catalogue, with some 180 entries, appeared in Encke's (1847) revision of Olbers' (1797) work on orbit determination, and it was the first comet catalogue to utilize the system of Roman numerals to indicate the order in which comets passed perihelion in a given year.

By the mid-19th century it had become quite commonplace for popular astronomical texts and even general almanacs to include an abbreviated comet catalogue as an appendix. Such compilations rarely contained much original information, although it is interesting to mention the one by Peirce (1846), not just because it seems to have been the first comet catalogue published in the U.S., but because its author for the first time made a point of precessing all the angular elements to a standard equinox, namely, that of 1850.0; several orbit computations by Peirce were also included, notably some for the comets of 69 and 137 B.C.

In a third edition of Olbers' work on orbit determination, Galle (1864) incorporated a further supplementary comet catalogue. A complete catalogue published around the same time by Carl (1864) is useful in that it includes detailed references to positional observations of comets.

Galle's (1894) final comet catalogue, published when that author was 82 -- he died at the age of 98 soon after being privileged to witness Halley's Comet for a second time -- is one of the most reliable and certainly the most comprehensive comet catalogue ever produced. As many as 414 cometary apparitions were listed, and the 316-page volume was the last to give all (or almost all) the orbits that had been computed for each comet. The detailed notes enable the reader to follow the successive improvements of each orbit, from the preliminary parabolic orbits derived from three observations covering an interval of a few days to the general orbits fitted to all available observations and including allowance for planetary perturbations. The argument ω , rather than longitude $\tilde{\omega}$ of perihelion was uniformly used, and the inclination i covered the whole range $0-180^\circ$.

The principal orbit compilations of the early-20th century were those by Crommelin (1925, 1932). Although written in the form of brief supplements to the 1894 catalogue, they contained much useful original information. Yamamoto's (1936) "preliminary general catalogue" was a complete listing of a single orbit for each comet (nearly 650 entries), with T uniformly in Greenwich Mean Time and the angles in degrees and decimals, and it is a shame that that author's plan of producing a true successor to Galle's catalogue was never implemented. Baldet's (1952) catalogue added more than 100 further entries to Yamamoto's and also gave the orbits to the higher precision that was standard to the 19th-century catalogues. This catalogue depended heavily on its predecessors, however, and in the course of time a rather considerable number of errors had been introduced. Errors also plague the catalogue by Vsekhsvyat-skij (1958), although that work does

contain in addition a great deal of useful information about the physical observations made of each comet.

The modern era opened with the comet catalogue by Porter (1961). With the assistance of several members (including the present author) of the British Astronomical Association's Computing Section, Porter succeeded in producing a catalogue with a high standard of accuracy, and for the first time since Peirce's (1846) effort the angular elements were precessed to a standard equinox, in this case 1950.0. File cards were prepared for each of the 830 comets following consultation of the original literature, not earlier comet catalogues, and the hand computation of precession to 1950.0 was done in duplicate. Another useful feature of the Porter catalogue was a classification system designed to indicate the reliability of each orbit. A supplement to this catalogue was subsequently prepared by the present author (Marsden, 1966).

The most recent orbit catalogues are the three editions of one prepared by the present author (Marsden, 1972, 1975, 1979). The number of entries increased to 924, to 964, and now to 1027. The production of these latest catalogues has been greatly facilitated for two reasons: the availability of the file cards prepared for Porter's (1961) catalogue and the utilization of a high-speed computer. Nevertheless, considerable further checking of the file cards was undertaken, and the original data were reconverted by computer to the standard form (including recalculation of precession to 1950.0). A few errors were found in the Porter catalogue, and these were mainly due to errors in the original references; they could be substantially reduced through comparison with other orbits calculated for the same comets. References are provided in the Marsden catalogues to alternative orbits that are of quality com-

parable to those selected in the general catalogue, and if there is serious unavoidable disagreement between the computations the alternative solutions are actually listed in the notes. The format adopted for the general catalogue permits mention there of the observational data on which each computation is

based. Two important new features of these catalogues are the inclusion of the osculation epochs to which the orbits refer (if perturbations are included) and a table listing the "nongravitational parameters" that must frequently be utilized if the orbits are to be made to agree with the observations.

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AA

NEWS OF RECENT COMETS

The recovery of Periodic Comet Tuttle-Giacobini-Kresak (1978r), by T. Seki (Geisei, Japan) from exposures taken 1978 Nov. 8 and Dec. 11, raised the number of comet discoveries/recoveries to 18 for the year 1978. Moreover, no fewer than 25 known comets reached perihelion in 1978, setting a record surpassing the previous high mark of 16 perihelion passages in 1974. Comet 1978r had total photographic magnitudes of 17 on Nov. 8.84 and 15 on

Dec. 11.85 UT. On the latter date, Seki reported the comet as a large diffuse object with condensation and a possible short tail, and as having movement southeastward in the constellation Virgo.

Charles T. Kowal, Hale Observatories, discovered the first comet of 1979 from plates taken with the 122-cm Schmidt telescope at Palomar on 1979 Jan. 27, 28, and 29. In late

(continued on page 26)

OBSERVATIONS OF RECENT COMETS

The following 8 pages of this issue contain observations of comets having recent apparitions; indeed, almost all of the observations here were made within the past two years. It is the objective of the Staff of the ICQ to publish the most recent observational data first, and at the same time work back through cometary information compiled from previous years. During the past few months, the ICQ has gained the support of several groups, some publications, and many individuals. Arrangements are now being made to eventually publish all of the observations of the Comet Section of the British Astronomical Association (BAA) dating back to 1948. We are working with the Section's Director, Michael J. Hendrie, toward publishing these observations in the ICQ, many of which have never before been published. We have also been given support from Dennis Milon, Recorder of the Comets Section of the Association of Lunar and Planetary Observers (ALPO), to publish backlogs of observations from that Section's massive files. Members of the well-known Japanese comet group Hoshino Hiroba have expressed interest and support for the ICQ. Guy M. Hurst, Editor of the English journal THE ASTRONOMER has acknowledged his support, as well. We hope eventually to reach all serious observers throughout the world, and to publish all of the observational data which reach the ICQ.

The observations which appear on the following pages have been placed in machine-readable form, with each line composing one card image. Curt Canada and Daniel Green developed a Fortran program in connection with the HP 3000 Series II computer at Valparaiso University, Indiana, to sort and print out the data as seen in this issue of the ICQ. It is planned to

use this program permanently, and the format is as follows.

Observations are listed first by comet (see index for this issue on page 11), second by chronological order. The comet's name (after its discoverer(s)) is listed ("P/" is given if it is periodic), and the name is followed immediately by the comet's provisional designation. The data for the particular listed comet follows that comet's heading. For convenience of reading, a line of headings for each column precedes each set of data. These 12 headings are described here in detail:

- (1) "DATE (UT)". Under this heading are reserved 14 column-spaces for numerical listing of the time of observation for magnitude estimates; the time is given to hundredths for all visual and photographic observations (the vast majority of those we receive), and to thousandths for photoelectric data. For example, "1977 09 15.79" means "1977 September 15.79 UT." (2) "MAG.". Six column-spaces are here reserved for the magnitude estimate; estimate is to tenths of a magnitude for visual data, and to hundredths for photoelectric. A colon (":") indicates an approximate value.
 - (3) "R". One column-space is reserved for the source of the magnitude estimate. For this issue, A = charts of the American Association of Variable Star Observers (AAVSO); S = Star Catalog of the Smithsonian Astrophysical Observatory; and N = North Polar Sequence. Also in this column, a "P" indicates a photographic magnitude, and "U, B, and V" are used for photoelectric values. Further key letters will be announced in coming issues as they are needed.
 - (4) "AP.". Five column-spaces are reserved for the aperture size of the instrument used for the magnitude estimate, all values in centimeters.
 - (5) "T". One column-space is reserved for
- (continued on page 26)

COMET KOHLER (1977M)

DATE (UT)	MAG. R	AP. T	F/ PWR	COMA	DC	TAIL	PA	OBS.
1977 09 15.79	10 :	15	L					RSC
1977 09 16.80	9.5:	10	B	14	3			BCK
1977 09 16.81	10 :	15	L					RSC
1977 09 17.83	10 :	20	L					GNE
1977 09 17.83	10 :	15	L					RSC
1977 09 17.86	9.7:	6	R					GUN
1977 09 17.92	9.4:	10	B	14	4			BCK
1977 09 18.90	9.1	10	B	14				BCK
1977 09 24.85	10 :	15	R	5				WVO
1977 09 28.75	9.5	15	R	5				WVO
1977 09 30.74	8.5:	8	B	22				RKR
1977 10 01.01	8.0	5.0	B	10	7.0	4/	0.25	45 JEB
1977 10 01.78	8.9	22	L					FVL
1977 10 01.81	8.3		B	4				PHW
1977 10 01.82	8.9	8.0	B	15	4			RPA
1977 10 01.84	8.4	26	L	5	7			GMH
1977 10 02	8.0	20	L					RGE
1977 10 02.78	8.8	22	L					FVL
1977 10 02.80	7.9	5.0	B	10	9	7	0.05	0 GMH
1977 10 02.80	8.	8.0	B	15	5			RPA
1977 10 02.80	7.6	5.0	B	10	4	4	0.13	22 GKI
COMA DIA. 6' IN 15, 10, OR 32 CM REFL.								
1977 10 02.91	8.5	8.0	B	15				DBR
1977 10 03.78	8.9	6.3	R	4	4	0.07		AUS
1977 10 03.81	9.1	25	L	5	2/	0.12		AUS
1977 10 04.80	8.9	8.0	B	15	4			RPA
1977 10 04.83	7.6	5.0	B	10	9			GMH
1977 10 04.83	8.0	8.0	B	10	7			JHO
1977 10 05	7.9	20	L					RGE
1977 10 05.02	7.8	5.0	B	10	5.2	5	0.10	65 JEB
NUCLEAR MAGNITUDE ESTIMATED AT 13.7 (32-CM REFL.).								
1977 10 07.76	8.3	6.3	R	7	3/	0.18		AUS
1977 10 07.80	7.3	5.0	B	10	5	4/		GKI
1977 10 07.80	8.5	7.6	R	5				MDT
1977 10 07.80	8.3	8.0	B	15	5			RPA
1977 10 07.83	7.2	5.0	B	10	10			GMH
1977 10 08.00	7.5	5.0	B	10	6.1	5	0.10	55 JEB
NUCLEAR MAGN. 13.0.								
1977 10 10.08	7.8 A	11	L 10	40	5			DNW
1977 10 17	7.4	20	L					RGE
1977 11 01.76	6.3 S	8.0	B	20	7	0.70	35	MCA
1977 12 07.97	7.4	5.0	B	10				DRO
1977 12 07.97	7.6	8.0	B	2	5.7	5		DRO
CIRCULAR, CONDENSED COMA; WITH 32-CM REFL. AT 110X, NUCLEAR MAG. 11-12, AND TAIL 12 ARCMIN LONG IN P.A. 335 (FAIRLY BROAD, FAINT).								
1977 12 09.97	7.5	5.0	B	10				DRO
1977 12 09.97	7.7	8.0	B	20	4			DRO
RATHER WELL-CONDENSED COMA WITH DIFFUSE BOUNDARIES.								
1977 12 27.96	8.2	8.0	B	20				DRO
1977 12 27.96	8.7	32	L	55	3	2		DRO

COMET BRADFIELD (1978C)

DATE (UT)	MAG. R	AP. I	F/ PWR	COMA	DC	TAIL	PA	OBS.
1978 02 20.75	6 :	8.0 B	15				215	DAS
1978 02 28.31	6.5	7.0 B	10					VAN
1978 03 08.53	5.8:	8.0 B	11	2.5				PLC
1978 03 10.32	5.0	7.0 B	10			0.28	270	VAN
1978 03 10.77	5	8.0 B	15					DAS
1978 03 14.50	5.5	13 R	20			0.13	240	PMA
1978 03 15.50	5.4	13 R						PMA
1978 03 16.48	5.5	13 R						PMA
1978 03 17.48	5.5	13 R						PMA

COMET MEIER (1978F)

DATE (UT)	MAG. R	AP. I	F/ PWR	COMA	DC	TAIL	PA	OBS.
1978 05 03.94	9.1	26 L		1.5	4			GMH
STELLAR POINT-NUCLEUS OF PERHAPS MAG. 12.5 SUSPECTED.								
1978 05 08.16	10.4 A	23 R	120	1.5	7			CSM
1978 05 09.89	9.1	26 L		1.5	4/			GMH
1978 05 09.89	10.0	20 L	83	0.8	5			GKI
WEAK DIFFUSE HALO EXTENDED TO 1.3 ARCMIN WITH AVERTED VISION; AT 131X, SEEN AS EVENLY BRIGHT, DIFFUSE NEBULA, 1.0 ARCMIN DIA. COMET NOT DETECTED IN 15X80 BINOCULARS.								
1978 05 09.89	9	21 L		2				KMS
POSSIBLE SMALL NUCLEUS TO THE WEST OF CENTER.								
1978 05 09.89	9	22 L		2				KMS
1978 05 09.92	10 :							BMA
1978 05 09.92	10 :							BMA
1978 05 11.10	10.3 A	23 R	120	1.5	7	0.10	45	CSM
ADDITIONAL TAILS: 6 ARCMIN IN P.A. 0, 4 ARCMIN IN P.A. 90, TAILS MEASURED FROM CENTER OF COMA; NUCLEAR MAG. ESTIMATED TO BE 13.								
1978 05 12.09	9.8 N	8 B	20	3	7			CSM
1978 05 17.92	10 P	26.5 L						BMA
1978 05 17.93	10 P	26.5 L						BMA
1978 05 25.91	10 :	20 L	45					GKI
1978 05 25.91	10 :	20 L	45					GKI
1978 05 26.97	10.4	20 L	35	2.5	7			GKI
1978 05 26.97	10.4	20 L	35 & 2.5	7				GKI
1978 05 27.94	10.2	20 L	35 & 3	5/				GKI
AT 45X, COMA WAS BRIGHT AND INTENSE FOR APPROX. 1 ARCMIN; DIFFUSE HALO TO ALMOST 3 ARCMIN.								
1978 05 28.94	10.2	8.0 B	15	2				GKI
1978 05 28.94	10.2	20 L	45	1.6	6			GKI
CIRCULAR COMA HAD EVEN BRIGHTNESS OVER 0.7 ARCMIN, WITH DIFFUSE HALO TO 1.6 ARCMIN DIA.; WITH AVERTED VISION, HALO SUSPECTED TO 2.5 DIA.								
1978 06 10.96	9.5	20 L	35 & 1	6				GKI
POSSIBLE HALO 1.3 ARCMIN DIA.; WEAK HALO MORE NOTICEABLE AT 50X.								
1978 06 17.94	9.2:	20 L	35 & 2					GKI

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COMET MEIER (1978F) CON'T

DATE (UT)	MAG. R	AP. T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1978 07 01.10	9.2	32	L	6	2.7	6	0.10	.65	JEB
1978 07 06.10	8.4	32	L	6	2.4	6			JEB
1978 07 12.10	7.9	32	L	6	2.2	6			JEB
1978 07 13.10	7.8	32	L	6					JEB

COMET MACHHOLZ (1978L)

DATE (UT)	MAG. R	AP. T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1978 09 17.79	10.5	12	L	33	1.5	4			KSA
1978 09 26.39	10.1	32	L	6	1.7	2			JEB
1978 09 29.40	10.6:	32	L	6	1.8	1			JEB
1978 10 02.80	11 :	12	L	50	1.5	3			KSA

COMET SEARGENT (1978M)

DATE (UT)	MAG. R	AP. T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1978 11 06.98	8.5	9.6	L		10.0				VAN

P/COMET TUTTLE-GIACOBINI-KRESAK (1978R)

DATE (UT)	MAG. R	AP. T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1978 11 08.84	17 P								TSE
1978 12 11.85	15 P								TSE
1978 12 27	111	32	L						JEB

P/COMET HANEDA-CAMPOS (1978J)

DATE (UT)	MAG. R	AP. T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1978 08 11.70	11 P								MPC
1978 09 02.14	9 P								REM
1978 09 02.57	10 P								MPC
1978 09 02.66	10 :	12	6	33	2	3/			KSA
1978 09 03.17	9 P								REM
1978 09 04.52	10 P								MPC
1978 09 05.10	11.2	32	L		1.5	4			JEB
1978 09 06.11	11.2	32	L		1.7	1			JEB
1978 09 08.08	10.4 N	15	L	48					CSM
1978 09 10.08	9.9 N	8	B	20	4	2			CSM
1978 09 12.66	10 P								MPC

P/COMET AREND-RIGAUX (1977K)

DATE (UT)	MAG. R	AP. T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1978 02 03.99	13.1	32	L	6	0.6				JEB
1978 02 04.99	13.0	32	L	6	0.8	1			JEB
1978 02 09.00	12.9	32	L	6	0.9	2			JEB
1978 02 10.01	13.0	32	L	6	0.9	2			JEB
1978 02 11.02	13.0:	32	L	6	0.8				JEB

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INTERNATIONAL COMET QUARTERLY

P/COMET WILD 2 (1978B)

DATE (UT)	MAG.	R	AP.	I	F/	PWR	COMA	DC	TAIL	PA	OBS.
1978 02 02.85	12	P	26.5	L	4						BMA
1978 02 02.9	11.2		61	L	4						RHM
1978 02 02.94	12	P	61	L	4		0.5		0.02	60	RHM
1978 02 04.01	11.4		32	L	6		1.3	4/			JEB
1978 02 05.00	11.5		32	L	6		1.1	5			JEB
1978 02 05.48	11	:	61	L	4	61					RHM
1978 02 08.9	10.5:		61	L	4						RHM
1978 02 08.90	12	P	61	L	4						RHM
1978 02 09.02	11.5		32	L	6		1.2	5			JEB
POSSIBLE STELLAR NUCLEUS OF ABOUT MAG. 14; AT 110X, CIRCULAR COMA SHARPLY CONDENSED AT CENTER WITHIN DIA. OF 0.2 ARCMIN.											
1978 02 09.85	11.3		26	L		8 2					GMH
EXTREMELY CONDENSED INNER REGION OF APPROX. MAG. 13.5, DIA. ABOUT 5 ARCSEC.											
1978 02 09.85	11.3		32	L	6		1.2	5			JEB
1978 02 10.83	12	P	26.5	L	4					60	BMA
1978 02 11.02	11.4		32	L	6		1.2	5			JEB
1978 02 25.03	11.5		32	L			1.3	5			GMH
1978 03 03.10	11.8:		23	R			1.5				SUM
1978 03 03.91	11.7		32	L			3	9			GKI
1978 03 03.93	11.5		26	L			2	2			GMH
1978 03 04.85	12	P	26.5	L							BMA
1978 03 04.87	11.9		32	L		56	1				GMH
1978 03 04.96	11.5		26	L			1.5	2			GMH
1978 03 05.03	11.6		32	L	6		1.4	4/			JEB
1978 03 05.82	12.2		32	L		84	0.7	4/			GKI
1978 03 05.85	12	P	26.5	L							BMA
1978 03 05.86	11.6		26	L			1.5	2			GMH
1978 03 05.91	12	P	61	R					0.02	45	APD
1978 03 06.06	11.6		32	L	6		1.5	4/			JEB
1978 03 06.81	12.0		32	L			0.5	6			GKI
1978 03 06.85	12	P	26.5	L							BMA
1978 03 07.07	11.5		32	L	6		2.0	4/			JEB
FAINT STELLAR NUCLEUS OF MAG. 13.5 TO 14.											
1978 03 08.81	11.5		32	L		84	1.5	6			GKI
1978 03 08.90	11.9		61	L	4	61					RHM
1978 03 10	11.6		23	R			3		0.02	235	SUM
CONDENSED INNER COMA 2 ARCMIN DIA.; JETS AT P.A. 235 AND 305, EACH HAVING AN APPROX. LENGTH OF 1.5 ARCMIN.											
1978 03 12.89	12	P	26.5	L							BMA
1978 03 12.9	12	:	26.5	L							BMA
1978 03 14.03	11.5		32	L			1.3	4/			JEB
TINY, NON-STELLAR CONDENSATION AT CENTER OF COMA.											
1978 03 21.06	11.4		23	R							SUM
1978 03 23.05	11.4		23	R							SUM
1978 03 26.86	11.5:		22	L			2				KMS
1978 03 27.82	11.9 A		26	L			1.5	2/			GMH
1978 03 29.85	12.0		26	L			1.5	1			GMH
1978 03 30.05	11.0		32	L			1.3	4/		80	JEB

P/COMET WILD 2 (1978B) CON'T

DATE (UT)	MAG. R	AP. T	F/ PWR	COMA	DC	TAIL	PA	OBS.
1978 03 30.80	11.5	22	L	2				KMS
1978 03 31.06	11.3	23	R	2.5		0.04	90	SOM
VERY CONDENSED; PARABOLIC HOOD FORMING.								
1978 04 01.03	11.1	23	R	2.5		0.05	90	SOM
TAIL BROAD AND FANNED WITH BRIGHTEST EXTENSION DUE EAST; FAN RANGED FROM P.A. 45 TO 90; INNER COMA NARROWLY EXTENDED IN P.A. 170.								
1978 04 03.02	11.0	23	R	2.5		0.05	48	SOM
FANNED TAIL TO P.A. 90.								
1978 04 05.89	12.5 P	26.5	L					BMA
1978 04 06.26	11.5	20	L	2				PLC
1978 04 07.18	11.3	20	L	2				PLC
SLIGHTLY ELONGATED.								
1978 04 08.17	11.4	20	L					PLC
1978 04 10.10	11.2	23	R	2.5		0.08	44	SOM
PARABOLIC HOOD; TAIL FAN, 2 BRIGHT EXTENSIONS 5 ARCMIN LONG, P.A. 47 AND 42 DEG.								
1978 04 12.22	11.1	20	L					PLC
1978 04 12.88	12.5 P	26.5	L					BMA
1978 04 12.89	12.5 P	26.5	L					BMA
1978 04 13.08	11.2	23	R	2.3				SOM
ROUGHLY CIRCULAR COMA WITH INDENTATION OF INNER COMA IN N-NE POSITION. MOON ABOUT 10 DEG. AWAY.								
1978 04 15.05	11.3	23	R	2				SOM
CONDENSED CENTER, DIFFUSE OUTER COMA; MOON 20 DEG.								
1978 04 19.04	11.3	23	R	8 3		0.05	18	SOM
TAIL FAN 3 ARCMIN IN P.A. 0 TO 35 DEG. OVAL COMA.								
1978 04 30.06	11.1	23	R	8 2.5		0.07	30	SOM
1978 05 03.06	11.1	23	R	2.7			225	SOM
1978 05 08.12	11.2	23	R	1.5				SOM
1978 05 08.12	11.2	23	R	1.5	2			CSM
1978 05 08.19	11.2	20	L					PLC

P/COMET ASHBROOK-JACKSON (1977G)

DATE (UT)	MAG. R	AP. T	F/ PWR	COMA	DC	TAIL	PA	OBS.
1978 07 01.29	12.9	32	L 6	0.5	3			JEB
1978 07 12.30	12.8	32	L 6	0.6	2			JEB
1978 07 13.30	12.9	32	L 6	0.6	3			JEB
1978 07 31.02	14.2 P							MVD
1978 08 01.01	14.0 P							MVD
1978 08 02.02	14.0 P							MVD
1978 08 11.34	12.0	32	L 6	1.1	3/			JEB
1978 08 30.34	11.6	32	L 6	0.9	4	0.05	233	JEB
1978 09 02.31	11.6	32	L 6	1.0	5	0.03	253	JEB
1978 09 05.31	11.6	32	L 6	0.8	7	0.05	250	JEB
1978 09 10.31	11.7	32	L 6	1.3	5	0.10	245	JEB
1978 09 24.11	11.6	32	L 6	0.9	5/	0.03	255	JEB
1978 09 25.90	12 P	26.5	L					BMA
1978 09 26.07	11.5	32	L 6	0.9	5			JEB
1978 09 29.11	11.7	32	L 6	1.1	5			JEB

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P/COMET ASHBROOK-JACKSON (1977G) CON'T

DATE (UT)	MAG. R	AP. T	F/ PWR	COMA	DC	TAIL	PA	OBS.
1978 09 30.11	11.6	32	L 6	1.2	5			JEB
1978 10 01.92	11.3	20.3	L 79	1.7	3		280	GKI
COMA WAS BRIGHT TO A DIA. OF 0.4 ARCMIN, BUT WITH AVERTED VISION, A TENUOUS HALO COULD BE SEEN TO 1.7 ARCMIN.								
1978 10 03.10	11.5	32	L 6	1.8	5			JEB
1978 10 03.92	11 :	20	L	1.4	4	0.07	270	GKI
COMA POSSIBLY FAN-SHAPED TOWARDS NW.								
1978 10 04.89	11 :	20	L 79 &	1.4	4			GKI
1978 10 06.89	11.6	20	L 79	1.4	2/	0.13	257	GKI
COMA FANNED AT P.A. 270-305; COMA DIA. 1.8 ARCMIN AT 50X.								
1978 10 07.13	11.6	32	L 6	1.3	5			JEB
1978 10 07.88	11.7	20	L 79	1.6	2			GKI
COMA POSSIBLY FAN-SHAPED IN P.A. 270.								
1978 10 08.36		20	L 79	1.5				GKI
1978 10 09.14	11.6	32	L 6	2.0	6	0.12	230	JEB
1978 10 11.01	12.0	20	L	1.2	2/			GKI
1978 10 21.03	11.7	32	L 6	1.2	2/			JEB
1978 10 22.03	11.8	32	L 6	1.2	2/			JEB
1978 10 22.85	12 P	26.5	L					BMA
1978 10 22.87	11.9	20	L 79 &	1	1/			GKI
1978 10 23.81	11.9	20	L	0.8	3			GKI
1978 10 23.84	11.5	26	L 80	2.5				GMI
1978 10 25.05	11.8	32	L 6	1.4	3			JEB
1978 10 25.80	12.0	20	L &	0.82				GKI
1978 10 26.96	12.1	20	L	1	3			GKI
1978 10 28.86	12 P	26.5	L					BMA
1978 10 30.07	11.8	32	L 6	1.2	3			JEB
1978 11 01.11	11.7	32	L 6	1.7	3			JEB
1978 11 03.07	11.8	32	L 6	1.3	2			JEB
1978 11 26.97	12.6	32	L 6	1	0			JEB
1978 12 03.06	12.6	32	L	1.3				JEB
1978 12 03.06	12.6	32	L 6	1.3	1			JEB
1978 12 22.00	113.0	32	L 6					JEB

P/COMET GICLAS (1978K)

DATE (UT)	MAG. R	AP. T	F/ PWR	COMA	DC	TAIL	PA	OBS.
1978 09 08.30	15.6 P							HLG

P/COMET DENNING-FUJIKAWA (1978N)

DATE (UT)	MAG. R	AP. T	F/ PWR	COMA	DC	TAIL	PA	OBS.
1978 10 12.79	11 :	12	L 33	2	2			KSA
1978 10 13.38	10.5	12	L 33	2/	3			KSA
1978 10 16.79	11	12	L 33	3	4			KSA
1978 10 17.81	11 :	12	L 33		3			KSA

P/COMET COMAS SOLA (1977N)

DATE (UT)	MAG. R	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1978 11 10.40	113.0	32	L	6						JEB
1978 11 29.39	13.4	32	L	6		8 1.3				JEB
1978 11 29.39	13.4:	32	L	6		8 1.3				JEB
1978 12 06.40	13.1	32	L	6		0.9				JEB
1978 12 06.40	13.1	32	L	6		0.9	2			JEB

P/COMET CHERNYKH (1977L)

DATE (UT)	MAG. R	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1977 09 12.14	12.7	32	L			0.7	4			JEB
AT 110X, A STELLAR NUCLEUS OF MAGN. 13.8. BOUNDARIES DIFFUSE.										
1977 09 15.33	12.7	32	L			0.5	3			JEB

P/COMET SCHWASSMANN-WACHMANN 1

DATE (UT)	MAG. R	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1978 01 31.15	12.5:	32	L	6		8 2				JEB
1978 02 04.01	12.5	32	L	6		1.8	0			JEB
1978 02 05.02	12.7:	32	L	6	88	8 2	0			JEB
1978 03 06.07	13.2	32	L	6		0.3	3			JEB
STELLAR NUCLEUS OF ABOUT MAG. 14.5.										
1978 03 07.05	13.0	32	L	6		0.5	9			JEB
COMET APPEARS AS A STAR SURROUNDED BY A VERY FAINT, DIFFUSE COMA.										
1978 03 08.02	13.0	32	L	6		0.3	9			JEB
NUCLEUS LIKE A PLANETARY DISK WITH APPROX. DIA. OF 2 ARCSEC.										
1978 03 09.17	12.9	32	L	6		0.5	8			JEB
1978 03 14.05	12.5	32	L	6		0.5	4			JEB
AT 146X, SUGGESTIONS OF A NEW 14.5-MAG. NUCLEUS.										
1978 03 30.04	12.5	32	L	6		1.1	2			JEB
1978 04 03.04	12.4	32	L	6						JEB
1978 04 08.0	113	32	L	6						JEB
1978 10 08.36	11.8	32	L	6		1.4	3			JEB
1978 10 09.37	11.8	32	L	6		1.4	1/			JEB
1978 10 30	113	32	L	6						JEB
1979 01 01.69	13 :	20	L		84	0.4	6			KNA
1979 01 02.61	13 :	20	L		84	0.5	5			KNA
1979 01 05.73	13 :	20	L		84	0.6	5			KNA
1979 01 06.95	15 P	10	L			8 0.17				WLF
1979 01 23.28	11 :	155	L			8 0.17				CYS
1979 02 04.09	12.7	32	L	6		8 0.4				JEB
1979 02 14.01	12.0	32	L			1.6				JEB
1979 02 17.06	11.9	32	L			1.6				JEB
1979 02 20.00	12.0	32	L			> 1.2				JEB
1979 02 21.11	12.0	32	L			> 1				JEB

KEY TO OBSERVERS

APO 01 A. POTTS, KNOTSFORD, CHESHIRE, ENGLAND

KEY TO OBSERVERS (CON'T)

AUS 01 A. USVAROSY, KATONA, HUNGARY
 BCK 10 BERND-CHRISTOPH KAEMPER, BIELEFELD, W. GERMANY
 BMA 01 B. MANNING, STAKENBRIDGE, KIDDERSMINSTER, ENGLAND
 CSM CHARLES S. MORRIS, PROSPECT HILL OBS., HARVARD, MA., USA
 CYS C.-Y. SHAO, HARVARD COLLEGE OBSERVATORY, USA
 DAS DAVID A. J. SEARJENT, THE ENTRANCE, N.S.W., AUSTRALIA
 DBR 01 D. BRANCHETT, EASILEIGH, HANTS, ENGLAND
 DNN DEREK N. WALLENINSEN, ALBUQUERQUE, N.M., USA
 DRO 01 D. ROSSITTER, WOKING, SURREY, ENGLAND
 FVL 01 F. VAN LOOY, RAYLEIGH, ESSEX, ENGLAND
 GKI 01 GRAHAM KEITCH, STOKE GIFFORD, NR. BRISTOL, ENGLAND
 GMH 01 GUY M. HURSI, NORTHAMPTON, ENGLAND
 GNE 10 GEORG NEUMANN, RHEINE, W. GERMANY
 GUN 10 GUENTHER NEUE, DORTMUND, W. GERMANY
 HLG H. L. GICLAS, LOWELL OBSERVATORY, ARIZ., USA
 JEB JOHN E. BORTLE, BROOKS OBSERVATORY, STORMVILLE, N.Y., USA
 JHU 01 J. HOSTY, HUDDERSFIELD, ENGLAND
 KMS 01 K. M. STURDY, HELMSLEY, YORK, ENGLAND
 KNA 06 KAZUO NAKAMURA, KURIKUMA OBS., KAGAWA PREFECTURE, JAPAN
 KSA 06 KIYOSHI SAKURAI, TANOMA OBS., JAPAN
 MCA MARCO CAVAGNA, MILAN, ITALY
 MDT 01 M. D. TAYLOR, WAKEFIELD, ENGLAND
 MPC M. P. CANDY, ET AL., PERTH OBSERVATORY, AUSTRALIA
 MVD 08 A. MRKOS, Z. VAVROVA, AND V. DUBOVA, KLET OBS., CZECHOSL.
 PBW 01 P. BIRTWHISTLE, CHEAM, SURREY, ENGLAND
 PLC PETER L. COLLINS, MT. HOPKINS OBS., ARIZONA, USA
 PMA PAUL MALEY, HOUSTON, TX., USA
 REM R. E. MCCRUSKY ET AL., HARVARD COLLEGE OBS., MASS., USA
 RGE RALPH GESCHWIND, MASSILLON, OHIO, USA
 RHM 01 H. CLOUGH AND R. H. MCNAUGHT, MACNAIRSTON OBS., SCOTLAND
 RKR 10 RUDOLF KRATOCHWILL, GRAZ-SEIERSBERG, AUSTRIA
 RPA 01 R. PANTHER, WALGRAVE, NORTHAMPTON, ENGLAND
 RSC 10 RUDIGER SCHMIDT, WESTERSTEDT, W. GERMANY
 SUM STEPHEN O-MEARA, HARVARD COLLEGE OBS., MASS., USA
 TSE T. SEKI, KOCHI OBS., GEISEI STATION, JAPAN
 VAN V. F. DE ASSIS NETO, SAO FRANCISCO DE OLIVEIRA, BRAZIL
 WLF 01 WERNER LANDGRAF, WIESBADEN, WEST GERMANY
 WVO 10 WOLFGANG VOLLMANN, PFAFFSTAETTEN, AUSTRIA

KEY TO SOURCES

01 THE ASTRONOMER
 02 INTERNATIONAL COMET QUARTERLY
 03 I.A.U. CIRCULARS
 04 TONIGHI'S ASTEROIDS
 05 COMETS SECTION, ASSN. OF LUNAR AND PLANETARY OBSERVERS
 06 HOSHINO HIROBA, JAPAN
 08 MPC'S (MINOR PLANETS AND COMETS), I.A.U.
 10 BEOBSACHTUNGEN, EDITED BY M. GROSSMANN, GRONAU, W. GERMANY

NEWS OF RECENT COMETS

(cont. from page 16) January, the 17th-magnitude diffuse object was moving through the northern part of Cetus in a southeasterly direction. Brian G. Marsden has shown Comet Kowal 1979a to be periodic, with an orbital period of 7.05 years and an eccentricity of 0.5844. This comet reached perihelion on 1979 Jan. 14 at a distance of 1.528 AU from the sun, and it has an aphelion of 3.68 AU. Detailed elliptical elements appear on IAU Circular No. 3336.

Periodic Comet Daniel was recovered on a plate taken by P. R. Standen (Royal Observatory, Edinburgh, Scotland) with a 122-cm Schmidt telescope on 1979 Feb. 2. Comet 1979b was well-condensed, with no tail, and of total photographic magnitude 19.

Periodic Comet Schwassmann-Wachmann I has undergone some recent characteristic bursts in brightness. C.-Y. Shao, Harvard College Observatory, photographed this comet at nuclear magnitudes ~ 15 on 1978 Nov. 1.31, ~ 13 -14 on Dec. 3.27, and ~ 11 on 1979 Jan. 23.28. By Jan. 24.28, there was an "increase in size, with a circular outer coma having become visible" (IAUC 3322). John E. Bortle (Stormville, N.Y.) reports this comet to have had a total visual magnitude of 11.9 and a coma diameter of 2'7" on Mar. 17.05 UT with a 32-cm reflector; on Mar. 21.03, he found $m_1 = 11.8$ and the diameter = 2'8". By Mar. 28.05, he only glimpsed the comet at magn. ~ 13 . The February 1979 issue of THE ASTRONOMER reports that P. J. Madej (Huddersfield, England) just glimpsed the comet at the limit of his 16-cm f/4 refl. (24x) on 1979 Jan. 26.843 UT (20^h14^m), and 11 minutes later "it was quite easily seen using 50x and gave the appearance of a fuzzy star of magn. ~ 11 and diameter 1' to 4'."

OBSERVATIONS OF RECENT COMETS

(text continued from p. 17) the type of instrument used (e.g., L = reflector, R = refractor, B = binoculars, etc.). (6) "F/". F-ratio of instrument. (7) "PWR". Magnification, or power, used for observation, up to 4 column-spaces. (8) "COMA". Coma diameter in minutes of arc; space is reserved for 6 column-spaces, for values to hundredths of a minute. An ampersand ("&") indicates an approximate value. (9) "DC". Degree of condensation of the coma; 0 = extremely diffuse, 9 = stellar in appearance. A slash ("/") indicates midway between 2 numbers (e.g., "3/" means either 3½ or 3-4). (10) "TAIL". Tail length in degrees, to hundredths of a degree. (11) "PA". Position angle of tail from nucleus (0 = north, 90 = east, etc.). (12) "OBS.". Observer with three initials. Key appears at end of lists of observations.

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THE NETHERLANDS

VIA AIR MAIL

AIR MAIL