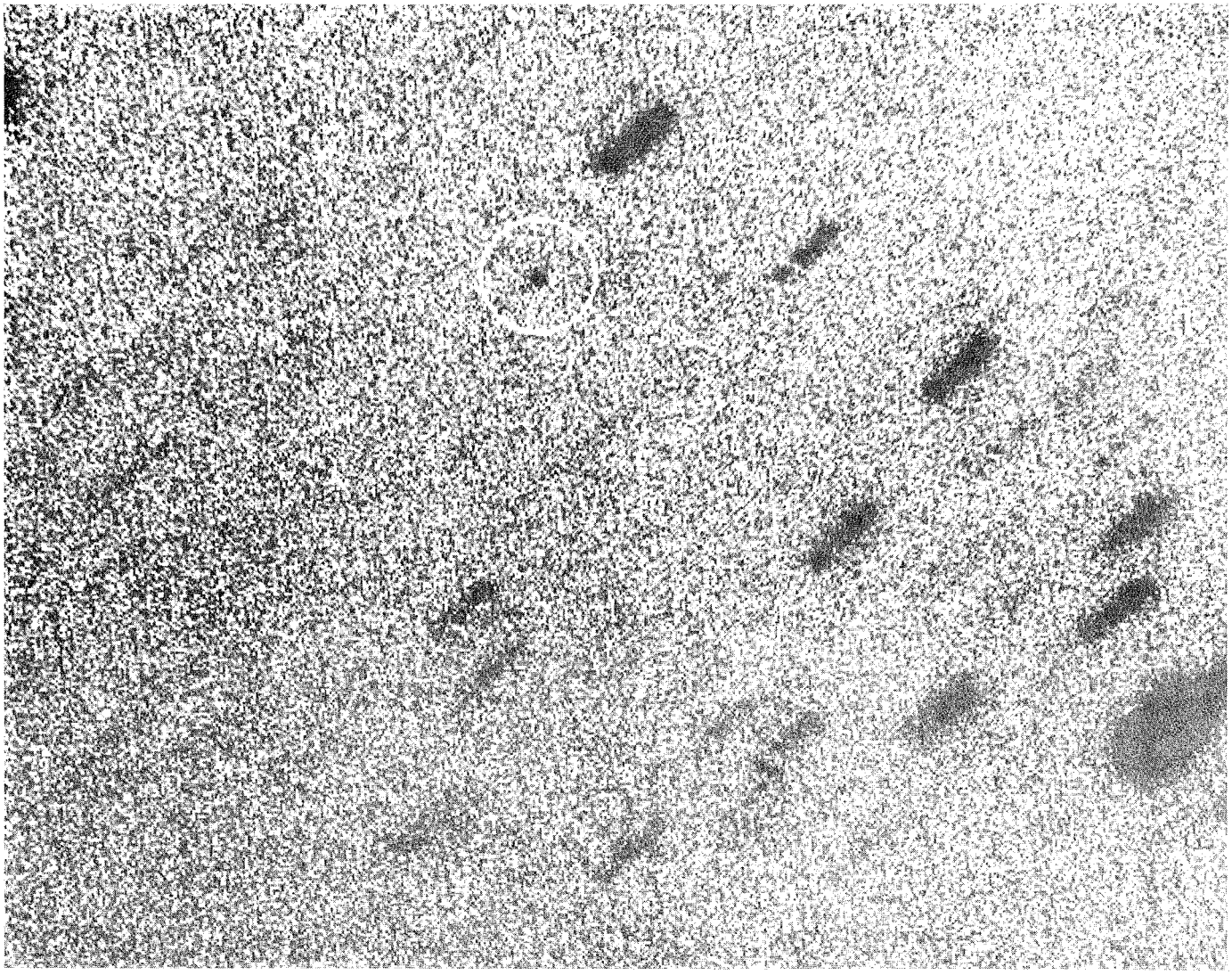
THE INTERNATIONAL COMET QUARTERLY

WHOLE NUMBER 50 APRIL 1984 VOL. 6, NO. 2



Recovery of periodic comet Giacobini-Zinner (object in circle), as made with a CCD and the Kitt Peak 4-m reflector on April 3 by S. Djorgovski, H. Spinrad, G. Will, and M. J. S. Belton. The slight elongation of the comet's image is the result of slight smearing during each of the four separate exposures (frames), each frame being a 150-second exposure; the comet moved a few arc seconds during the intervals between frames. Each pixel represents 0.3 arcsec. The stars are strongly elongated throughout the photo, as the telescope was tracking the motion of the comet. The comet was just inside the orbit of Jupiter (roughly 700 million km from the sun) when the photo was taken. [Courtesy Kitt Peak National Observatory, copyright 1984, AURA, Inc.]

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INSIDE THIS ISSUE

THE INTERNATIONAL COMET QUARTERLY (ICQ) is a non-profit journal devoted to news and observation of comets. Issues are published 4 times per year (January, April, July, and October). The ICQ is published by the Department of Physics and Astronomy at Appalachian State University in Boone, North Carolina, U.S.A.

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Make checks or money orders payable in U.S. funds to INTERNATIONAL COMET QUARTERLY and send to Daniel Green; Smithsonian Observatory; 60 Garden St.; Cambridge, MA 02138, U.S.A. Group subscription rates and advertising rates are available upon request. Manuscripts will be reviewed for possible publication; send typed, double-spaced copy to the Editor (address above).

Cometary observations also should be sent to the Editor at the above address. Back issues are available from Dr. T. Rokoske; Dept. of Physics and Astronomy; A.S.U.; Boone, NC 28608, USA.



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This issue is No. 50 of the publication originally called THE COMET, founded in March 1973, and is Vol. 6, No. 2, of the ICQ. 

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Ephemeris for P/Russell 4 (from elements by B. G. Marsden on MPC 8672):

Orbital elements (equinox 1950.0):
T = 1984 Jan. 6.71849 ET
Arg. of Peri. = 91°.66311 P = 6.38 yrs
Node = 71.79785 e = 0.3813818
Incl. = 6.2539 7 q = 2.1272025 AU

| Date | ET | R. A. (1950) | Decl. | Delta | r | Elong. | Mag. |
|---|---|---|---|---|---|---|---|
| 1984 | 04 30 | 12 59.96 | +02 08.5 | 1.338 | 2.279 | 152.5 | 14.2 |
| 1984 | 05 05 | 12 57.87 | +01 56.8 | | | | |
| 1984 | 05 10 | 12 56.39 | +01 40.9 | 1.419 | 2.305 | 142.7 | 14.4 |
| 1984 | 05 15 | 12 55.53 | +01 20.9 | | | | |
| 1984 | 05 20 | 12 55.30 | +00 57.1 | 1.519 | 2.332 | 133.3 | 14.6 |
| 1984 | 05 25 | 12 55.70 | +00 29.9 | | | | |
| 1984 | 05 30 | 12 56.71 | -00 00.4 | 1.633 | 2.361 | 124.6 | 14.8 |
| 1984 | 06 04 | 12 58.31 | -00 33.5 | | | | |
| 1984 | 06 09 | 13 00.47 | -01 09.2 | 1.760 | 2.391 | 116.4 | 15.0 |
| 1984 | 06 14 | 13 03.15 | -01 47.0 | | | | |
| 1984 | 06 19 | 13 06.30 | -02 26.6 | 1.897 | 2.422 | 108.7 | 15.2 |
| 1984 | 06 24 | 13 09.91 | -03 07.8 | | | | |
| 1984 | 06 29 | 13 13.92 | -03 50.3 | 2.040 | 2.455 | 101.5 | 15.4 |

# ICE AND COMETS

Fred L. Whipple
Harvard-Smithsonian Center for Astrophysics

A warm conference on a cold subject was held in mid-winter in Nice, France, on 1984 January 16-19. Sponsored by the North Atlantic Treaty Organization (NATO), the Advanced Research Workshop on "Ices in the Solar System" was organized by Juergen Klinger, an amorphous ice specialist from the University of Grenoble, and by Daniel Benest of the Nice Observatory. Audouin Dollfus, the great planetary observer of the Observatoire de Paris, and Roman Smoluchowski, another ice specialist from the University of Texas, were the scientific co-directors of the workshop.

The conference brought together for the first time diverse groups of scientists whose researches involve ices as applied to bodies in the Solar System -- not including subjects such as terrestrial ice meteorology and glaciology, except where it is representative of phenomena observed in planets, satellites, comets, and rings elsewhere in the solar system. Cometary observations and problems were of major interest to the conference, and a third of the papers were devoted to these topics. The participants were divided into two groups: a minority of ice experts and a majority of "ice observing astronomers". Considerable time was spent (effectively) by tutorials from each group explaining their techniques and conclusions or observations to the others. My role was to talk about the present status of the icy-conglomerate model for comets.

Armand Delsemme discussed what we do not know about comets. Actually, he seemed surprised by his own study of a number of new and old comets, all of which showed their major coma activity within 1.5 to 3 AU of the sun, apparently controlled by water ice. Clearly, more volatile ices are needed to account for a number of comets active at large solar distances, comet splitting, and P/Schwassmann-Wachmann 1 (with its great bursts at more than 7 AU from the sun).

Amorphous water ice seemed to fit the bill, perhaps abetted by a bit of carbon dioxide. Klinger and Smoluchowski discussed the peculiar properties of amorphous water ices, frozen out at very low temperatures. On heating to about 150 degrees Kelvin (150 K), the ices transform to a cubic form and then to normal hexagonal ice at 210 K, giving out heat by these transitions. Smoluchowski showed how new comets, such as Kohoutek 1973f, could well become active at large solar distances. Klinger investigated the heat flow and internal warming of older comets that have been warmed by the Sun for many revolutions. Much depends on the highly different heat conductive properties of porous or of well-consolidated dirty ice.

H. Rickman of Uppsala showed that, for Halley's comet, the phase transition from amorphous ice might occur only 0.5 to 1.5 meters below the surface of the nucleus.

Humberto Campins of the University of Maryland found that the unique comet Bowell 1980b has a deep absorption band in the infrared near 3 microns, attributable to water ice grains in its hazy coma. His observations suggest the existence of two types of grains in the coma: old, dark ice-poor grains and fresh, ice-rich grains produced by the outburst near 1982 June 20 at r = 3.5 AU. M. Festou of CNRS discussed the observations and theory of the OH radical in comet Bowell.

D. A. Mendis (University of California, San Diego) discussed the strong effect of dust from comets increasing the effective heating of the nucleus, and thus their activity near the Sun. W. Ip, of the Max Planck Institut fuer Aeronomie at Lindau, discussed the making of comets by condensation and aggregation.

Mayo Greenberg of Leiden was the star performer of the conference, presenting the story of his laboratory production of pseudo-interstellar grains at 10 K from cosmic abundances of materials radiated with ultraviolet light. The cold-finger ices give chemiluminescent explosive light flashes and vapor-pressure spikes as they are heated, all illustrated by Greenberg with motion pic-

ICE AND COMETS

tures. He visualizes the interstellar grains as having a core, largely of non-volatiles, coated with mantles of the amorphous icy mixtures. The grains gain or partially lose these outer icy mantles as they meet different temperature conditions in interstellar clouds. A thin layer of complex hydrocarbons develops around the refractory centers of the grain. Collapsing with the proto-solar nebula, they made the comets, according to his scenario.

Unexpected support for Greenberg's theory came from the discovery of the sulphur molecule, $S_2$, in the inner coma of the earth-grazer, comet IRAS-Araki-Alcock, in 1983 May, by Michael A'Hearn and D. G. Schleicher at the University of Maryland and Paul D. Feldman at Johns Hopkins. They find that $S_8$ rather than $S_2$ would be produced from the condensation of sulphur at low temperatures. Photolysis of compounds containing sulphur could, however, produce $S_2$. Because the lifetime of $S_2$ in the sunlight at 1 AU is only 450 seconds, they conclude that it must be a parent molecule. Thus, it must have been formed by some process akin to Greenberg's, and never heated again in comet 1983d until its passage through the inner solar system last year. This concept appears to be extremely important in theories of cometary origin.

Cristiano Cosmovici of the Space Research Group in Wessling, West Germany, and S. Ortolani of Asiago, Italy, presented their discovery of the HCO and $H_2S$ molecules in the spectrum of the same comet. They also suspect strongly the presence of the real formaldehyde molecule $H_2CO$, as well as DCO and $NH_4$.

And so the cometary portion of the icy workshop heated up our imaginations, providing a real sense of progress in understanding comets. I am particularly grateful to the organizers for enabling me to participate.

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## THE 1983 AMERICAN WORKSHOP ON COMETARY ASTRONOMY

Charles S. Morris
International Comet Quarterly

On October 1, 1983, the second American Workshop on Cometary Astronomy (AWCA) was held at the Jet Propulsion Laboratory (JPL) in Pasadena, California. The Workshop was sponsored by the ICQ and the International Halley Watch (IHW). Like the first AWCA (cf. ICQ 4, 39), the purpose of the 1983 meeting was to provide the opportunity for interested people to hear and discuss cometary topics together with well-known professionals and amateurs in the field.

More than 140 people, some coming from as far away as Florida and Canada, attended the one-day meeting. Tours of the JPL Space Flight Operations Facility and the Galileo "clean room" were provided, as well as a multi-media presentation, "Welcome to Space", which documented past and present JPL research activities.

The paper session commenced with an overview of the IHW by Stephen Edberg, the Coordinator for the Amateur Network of the IHW. In his talk, Mr. Edberg discussed the various professional observing networks as well as the Amateur Network. Narrowband comet photometry was reviewed by Ray Newburn of JPL. He presented results from his observational program, which included seventeen recent comets. Dr. Newburn gave a summary of how the production rates of various molecules vary as a function of heliocentric distance.

Zdenek Sekanina, also of JPL, presented a discussion about cometary nuclei. Of particular interest were the slides which Dr. Sekanina showed of the computer-enhanced pictures of P/Halley in 1910 (see last issue of ICQ, p. 11).

Following lunch, Paul Weissman, JPL, reviewed future spacecraft missions to comets, including those to comet Halley. For amateurs who wish to practice before P/Halley comes, Alan Hale reviewed the observing conditions for other returning periodic comets, including

## THE 1983 AMERICAN WORKSHOP ON COMETARY ASTRONOMY

P/Crommelin and P/Encke. Mr. Hale is the Southwest Regional Recorder of the IHW Amateur Observation Network (AON).

Aspects of comet photography were discussed by John Sanford, Western Photographic Recorder of the IHW AON. Dan Tidwell continued the photographic flavor of the meeting by illustrating the new Polaroid "Instant" 35mm film. Among the slides shown was a group photograph taken a couple of hours earlier; the results were quite impressive. Comet Swan band filters were described by Jack Marling of LUMICON; these filters will be reviewed in the next issue.

The final presentation was by John Bortle and this author, whose talks outlined various comet observing techniques for visual observers.

After dinner, an observing session was to have taken place, but California weather foiled the attempt. Instead, a lively panel discussion was held, with the audience asking many challenging questions. The 1983 AWCA was quite a success. For those of you who missed it, the next AWCA is scheduled for June 1985 in Tucson, Arizona. We expect an even larger turn-out then, since the Workshop will occur just a couple of months before P/Halley will become visible in amateur instruments.

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## TABULATION OF COMET OBSERVATIONS

Observers have remarked that it would be good if observations could list or include some more descriptive information (that is, information which cannot easily be given in the general tabulated ICQ lists). We include a column for remarks on the ICQ Observation Report Form, and ask that additional remarks be made on additional sheets of paper. Basically, observers have not been sending us additional information. Beginning with this issue, we will try to publish interesting notes to cometary observations in text form, either in this section of the ICQ (before the general tabulation of data) or under the regular column "Recent News Concerning Comets".

With this issue, the ICQ adds the following source for stellar V magnitudes for use with the making of total visual magnitude estimates of comets (especially fainter comet): Arlo Landolt published UBV photometry of 24 selected equatorial-area stars in the Astronomical Journal (1973, 78, 959). The V magnitudes go to fainter than 14 in many of the fields. Landolt published photographic field charts for locating the reference stars, and the ICQ Staff has been working for the past 6 months on preparing a set of 6 to 12 charts for use at the telescope. We are trying to "debug" the charts as much as possible before distributing them to observers, and are currently discussing whether to use Landolt's V magnitudes or to use some sort of visual magnitudes (reduced from the V and B-V values provided by Landolt, using some empirical formula). We hope to have the first set of 6 charts available later this year. For now, we are advocating the use of Landolt's sequences as a primary source for stellar magnitudes, and are using the letter "L" under the reference column for published observations (below) to indicate use of Landolt V magnitudes.

In issues Nos. 46-49 of the ICQ, we published 2,097 data lines under the Tabulation of Comet Observations, 1,167 of which were for periodic comets alone. The total number of cometary observations (individual data lines) now in the ICQ computer file (not including those published in this issue) total 11,014 -- quite a bit of information compiled from only 4-5 years of volunteer work! As can be seen from the "Recent News Concerning Comets" article in this issue, there are many, many comets now being observed visually and photographically, and we again ask ALL observers and group recorders to only use the ICQ Report Form for report-

(continued on next page . . .)

TABULATION OF COMET OBSERVATIONS

ing cometary observations (published in the last issue), to help the ICQ Staff in entering the data into machine-readable form.

DESCRIPTIVE INFORMATION CONCERNING COMETS (to complement the tabulated data)

P/Encke: Charles Morris (MOR) noted a narrow gas tail on March 20.14 UT, and a sunward fan on Feb. 20.14.

Černis (1983l): Terry Lovejoy (LOV) noted a starlike point of 12th magnitude at the center of the coma on Oct. 8.52.

P/Crommelin (1983n): V. F. De Assis Neto (DEA) noted a surprising decrease in the comet's magnitude (0.8) from March 23.95 to 24.95. Morris (MOR) noted that he may have observed a sunward fan on Jan. 25.15.

P/Kopff (1982k): Lovejoy (LOV) found the comet fan-shaped in a 19-inch reflector.

P/Hartley-IRAS (1983v): Morris (MOR) remarked on a very faint tail on Feb. 29.53.

NEW ADDITIONS TO THE ICQ OBSERVING KEY/LIST (cf. ICQ 5, 90):

| | |
|---|---|
| HAS02 | WERNER HASUBICK, WEST GERMANY |
| KOC | BERND KOCH, WEST GERMANY |
| KOC01 | VOLKMAR KOCH, WEST GERMANY |
| ZAN | MAURO ZANOTTA, ITALY |

Comet Austin (1982 VI = 1982g)

| DATE (UT) | MM | MAG. | RF | AP. | T | F/ | PWR | COMA | DC | TAIL | PA | OBS. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1982 08 17.31 | M | 4.7 | Y | 3.5 | B | | 7 | 5.0 | 5 | 1.50 | 40 | MOR02 |
| 1982 08 20.31 | M | 4.3 | Y | 3.5 | B | | 7 | 6.5 | 6 | 1.00 | 30 | MOR02 |
| 1982 08 23.32 | M | 4.7 | Y | 3.5 | B | | 7 | 8.0 | 7 | 1.00 | 32 | MOR02 |
| 1982 08 26.30 | M | 5.5 | Y | 3.5 | B | | 7 | 5.0 | 7 | 0.77 | 35 | MOR02 |
| 1982 08 27.31 | M | 5.5 | Y | 3.5 | B | | 7 | 5.0 | 6 | 0.67 | 35 | MOR02 |

Comet IRAS-Araki-Alcock (1983d)

| DATE (UT) | MM | MAG. | RF | AP. | T | F/ | PWR | COMA | DC | TAIL | PA | OBS. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1983 05 04.92 | S | 5.9 | Y | 5.0 | L | | 8 | 15 | 1/ | | | WEG |
| 1983 05 04.93 | B | 6.8 | Y | 5.0 | L | | 8 | 15 | 1/ | | | WEG |
| 1983 05 05.91 | S | 7.1 | Y | 8.0 | B | | 15 | | | | | BRI01 |
| 1983 05 05.92 | S | 6.0 | Y | 5.0 | B | | 7 | 30 | 2 | | | BUS01 |
| 1983 05 05.92 | S | 6.5 | Y | 8.0 | B | | 10 | | | | | COM |
| 1983 05 05.92 | S | 5.8 | Y | 6.8 | L | | 12 | | | | | BUS01 |
| 1983 05 05.92 | S | 6.2 | Y | 5.0 | B | | 7 | | | | | COM |
| 1983 05 05.93 | S | 5.8 | Y | 5.0 | L | | 8 | 25 | 2/ | 0.5 | 220 | WEG |
| 1983 05 05.94 | B | 7.0 | Y | 5.0 | L | | 8 | | | | | WEG |
| 1983 05 05.95 | S | 6.7 | Y | 5.0 | B | | 10 | 7 | 3 | | | POI |
| 1983 05 05.95 | B | 6.9 | Y | 5.0 | B | | 10 | | | | | POI |
| 1983 05 06.02 | M | 5.9 | Y | 5.0 | B | | 7 | &13.5 | 4/ | | | KUI |
| 1983 05 08.91 | S | 4.5 | Y | 5.0 | B | | 7 | 46 | 2/ | 0.5 | | COM |
| 1983 05 08.94 | S | 4.0 | Y | 6.8 | L | | 12 | | | | | BUS01 |
| 1983 05 08.94 | S | 4.2 | Y | 5.0 | B | | 7 | | | | | BUS01 |

Comet IRAS-Araki-Alcock (1983d) Cont.

| DATE (UT) | MM | MAG. | RF | AP. | T | F/ | PWR | COMA | DC | TAIL | PA | OBS. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1983 05 09.20 | M | 3.5 | AA | 3.5 | B | | 7 | 90.0 | 3 | 1.10 | 190 | MOR02 |
| 1983 05 10.00 | S | 3.3 | Y | 5.0 | B | | 10 | 50 | 3 | | | POI |
| 1983 05 10.20 | M | 2.6 | Y | 3.5 | B | | 7 | 90.0 | 3 | 2.00 | 305 | MOR02 |
| 1983 05 12.25 | M | 2.6 | Y | 3.5 | B | | 7 | 100.0 | 4 | | | MOR02 |
| 1983 05 14.43 | M | 3.9 | Y | 2.5 | B | | 2 | | | | | BOU |
| 1983 05 15.40 | M | 4.4 | Y | 2.5 | B | | 2 | 30 | 4 | | | BOU |
| 1983 05 16.41 | S | 4.7 | Y | 5.0 | B | | 10 | &17.5 | 5 | ?1.5 | 170 | BOU |
| 1983 05 16.43 | M | 4.7 | Y | 2.5 | B | | 2 | | | | | BOU |
| 1983 05 30.38 | S | 7.6 | AA | 11.0 | L | 4 | 20 | 5 | 4 | | | BOU |
| 1983 05 31.37 | S | 7.6 | AA | 11.0 | L | 4 | 20 | 5 | 3/ | | | BOU |
| 1983 06 04.37 | S | 7.9 | AA | 11.0 | L | 4 | 20 | 4 | 4 | | | BOU |
| 1983 06 08.48 | S | 7.9 | AA | 5.0 | B | | 10 | | 3 | | | POI |

Comet Sugano-Saigusa-Fujikawa (1983e)

| DATE (UT) | MM | MAG. | RF | AP. | T | F/ | PWR | COMA | DC | TAIL | PA | OBS. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1983 06 03.00 | B | 8.0 | AA | 12.7 | C | 10 | 31 | 8 | | | | HAS02 |
| 1983 06 03.00 | B | 8.0 | AA | 10.0 | B | 10 | 14 | 8 | | | | HAS02 |
| 1983 06 03.01 | S | 7.5 | S | 6.0 | B | 4 | 12 | | 1 | | | WEG |
| 1983 06 03.05 | B | 8.0 | AA | 5.6 | B | | 8 | | | | | KOC |
| 1983 06 03.06 | B | 8.0 | AA | 5.6 | B | | 8 | 6 | | | | KOC01 |
| 1983 06 05.04 | B | 7.5 | AA | 5.6 | B | | 8 | | | | | KOC |
| 1983 06 05.06 | B | 7.5 | AA | 5.6 | B | | 8 | 9 | | | | KOC01 |
| 1983 06 06.98 | S | 6.6 | S | 6.0 | B | 4 | 12 | 18 | 1 | | | WEG |
| 1983 06 07.98 | S | 6.6 | S | 5.0 | B | 4 | 7 | 20 | 0 | | | BUS01 |
| 1983 06 07.98 | S | 6.5 | S | 6.0 | B | 4 | 12 | 21 | 1 | | | WEG |
| 1983 06 08.05 | B | 7.3 | AA | 10.0 | B | | 14 | 10 | | | | HAS02 |
| 1983 06 08.06 | B | 6.5 | AA | 5.6 | B | | 8 | 12 | | | | KOC01 |
| 1983 06 08.89 | S | 6.6 | S | 5.0 | B | 4 | 10 | | 4 | | | POI |
| 1983 06 08.89 | S | 6.9 | S | 5.0 | B | 4 | 10 | | 4 | | | POI |
| 1983 06 08.96 | B | 7.2 | AA | 10.0 | B | | 14 | 10 | 0 | | | HAS02 |
| 1983 06 09.04 | B | 6.5 | AA | 5.6 | B | | 8 | | | | | KOC |
| 1983 06 09.98 | S | 6.7 | S | 6.0 | B | 4 | 12 | | 1 | | | WEG |
| 1983 06 11.99 | B | 8.0 | AA | 10.0 | B | | 14 | 15 | 1 | | | HAS02 |
| 1983 06 12.00 | B | 6.5 | AA | 5.6 | B | | 8 | | | | | KOC |
| 1983 06 12.00 | B | 7.2 | AA | 5.6 | B | | 8 | 10 | | | | KOC01 |
| 1983 06 14.67 | S | 7.0: | S | 11.0 | L | 4 | 20 | 15 | 0 | | | BOU |

Comet Černis (1983l)

| DATE (UT) | MM | MAG. | RF | AP. | T | F/ | PWR | COMA | DC | TAIL | PA | OBS. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1983 08 09.36 | S | 10.6 | AC | 15 | R | 5 | 31 | 3.5 | 4 | | | MOR03 |
| 1983 08 10.36 | S | 10.5 | AC | 15 | R | 5 | 31 | 3.5 | 4 | | | MOR03 |
| 1983 08 13.36 | S | 10.2 | A | 20 | C | 10 | 64 | 2.0 | 4 | | | SPR |
| 1983 08 13.36 | S | 10.6 | AC | 15 | R | 5 | 31 | 3.5 | 4 | | | MOR03 |
| 1983 08 14.43 | S | 9.7 | A | 20 | C | 10 | 64 | 2.5 | 4 | | | SPR |
| 1983 08 15.02 | S | 10.0 | A | 22.5 | R | 10 | 65 | | 5 | | | COM |
| 1983 08 15.04 | S | 10.6 | A | 25.8 | L | 5 | 49 | | 3/ | | | FEI |
| 1983 08 15.05 | S | 10.1 | A | 15.6 | L | 5 | 36 | 3 | 5/ | | | BOU |
| 1983 08 15.06 | S | 10.2 | A | 25.4 | J | 6 | 59 | & 2.5 | 5/ | | | BUS01 |
| 1983 08 16.08 | M | 10.0 | A | 25.4 | L | 6 | 70 | 2 | 6 | | | KUI |
| 1983 08 17.40 | S | 10.3 | A | 20 | C | 10 | 64 | 2.0 | 3 | | | SPR |
| 1983 08 18.42 | S | 10.0 | A | 20 | C | 10 | 64 | 2.0 | 4 | | | SPR |
| 1983 08 19.07 | M | 10.3 | A | 25.4 | L | 6 | 70 | 2.5 | 7 | | | KUI |

Comet Černis (19831) Cont.

| DATE (UT) | MM | MAG. | RF | AP. | T | F/ | PWR | COMA | DC | TAIL | PA | OBS. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1983 08 19.09 | S | 10.6 | A | 25.8 | L | 5 | 49 | | 5 | | | FEI |
| 1983 08 19.41 | S | 9.8 | A | 20 | C | 10 | 64 | 2.0 | 4 | | | SPR |
| 1983 08 20.44 | S | 9.4 | A | 20 | C | 10 | 64 | 2.25 | 5 | | | SPR |
| 1983 08 21.46 | S | 9.6 | A | 20 | C | 10 | 64 | 2.0 | 5 | | | SPR |
| 1983 09 03.25 | S | 10.7 | AC | 15 | R | 5 | 31 | 2.5 | 4 | | | MOR03 |
| 1983 09 04.30 | S | 10.8 | AC | 15 | R | 5 | 31 | 2.5 | 4 | | | MOR03 |
| 1983 09 08.37 | S | 10.3 | AC | 15 | R | 5 | 31 | 3.5 | 4 | | | MOR03 |
| 1983 09 11.05 | S | 9.9 | A | 15.6 | L | 5 | 36 | 3 | 5 | | | BOU |
| 1983 09 11.06 | S | 9.6 | A | 25.4 | J | 6 | 59 | & 3.5 | 5/ | | | BUS01 |
| 1983 09 15.37 | S | 10.5 | AC | 15 | R | 5 | 31 | 3.5 | 4 | | | MOR03 |
| 1983 09 19.09 | S | 9.9 | A | 15.6 | L | 5 | 29 | 3 | 3 | | | BOU |
| 1983 10 01.28 | S | 9.5 | S | 32 | L | 4 | 78 | | | | | KEE |
| 1983 10 06.01 | M | 9.6 | A | 25.4 | L | 6 | 70 | 2.5 | 7 | | | KUI |
| 1983 10 07.26 | S | 9.9 | AC | 15 | R | 5 | 31 | 4 | 5 | | | MOR03 |
| 1983 10 08.02 | S | 9.8 | A | 15.6 | L | 5 | 36 | 2.5 | 4 | | | BOU |
| 1983 10 08.04 | S | 10.0: | A | 15.6 | L | 5 | 36 | | | | | BUS01 |
| 1983 10 08.44 | S | 9.3 | A | 8.0 | B | | 15 | | | | | SEA |
| 1983 10 08.52 | S | 9.9 | A | 20 | L | 7 | 50 | 2 | 6 | | | LOV |
| 1983 10 09.27 | S | 9.8 | AC | 15 | R | 5 | 31 | 4.5 | 4 | | | MOR03 |
| 1983 10 24.43 | S | 9.7: | A | 8.0 | B | | 15 | | | | | SEA |
| 1983 10 25.45 | S | 9.9 | A | 8.0 | B | | 15 | | | | | SEA |
| 1983 10 27.42 | S | 9.9 | A | 8.0 | B | | 15 | | | | | SEA |
| 1983 10 27.84 | S | 10.4 | A | 26.0 | L | 6 | 63 | & 6.5 | 2 | | | MER |
| 1983 11 03.42 | S | 10.3 | A | 8.0 | B | | 15 | | | | | SEA |
| 1983 11 04.42 | S | 10.1 | A | 8.0 | B | | 15 | | | | | SEA |
| 1983 11 05.07 | S | 10.9 | A | 32 | L | | 68 | 2.0 | 4 | | | BOR |

Comet IRAS (1983o)

| DATE (UT) | MM | MAG. | RF | AP. | T | F/ | PWR | COMA | DC | TAIL | PA | OBS. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1984 03 11.52 | S | 12.8 | AC | 25.6 | L | 4 | 67 | & 1 | 5 | | | MOR |

Comet Shoemaker (1983p)

| DATE (UT) | MM | MAG. | RF | AP. | T | F/ | PWR | COMA | DC | TAIL | PA | OBS. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1983 09 30.86 | S | 12.0 | A | 25.4 | J | 6 | 59 | 1.5 | 2 | | | BUS01 |
| 1983 09 30.86 | S | 11.8 | A | 25.4 | J | 6 | 59 | 1.5 | 1/ | | | BOU |
| 1983 09 30.96 | S | 12.5 | A | 25.8 | L | 5 | 76 | | 3 | | | FEI |
| 1983 10 08.04 | S | 12.0: | A | 25.4 | J | 6 | 73 | | | | | BUS01 |
| 1983 10 08.06 | S | 12.0: | A | 25.4 | J | 6 | 73 | | | | | BOU |
| 1983 10 09.12 | S | 12.4 | AC | 15 | R | 5 | 62 | 1.4 | 2 | | | MOR03 |
| 1983 10 27.79 | S | 12.0 | A | 26.0 | L | 6 | 63 | 2.6 | 1 | | | MER |

Comet Bradfield (1984a)

| DATE (UT) | MM | MAG. | RF | AP. | T | F/ | PWR | COMA | DC | TAIL | PA | OBS. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1984 01 09.78 | S | 10.9 | VN | 41 | L | 4 | 86 | 1.75 | 2 | | | CLA |
| 1984 01 09.82 | S | 10.3 | VN | 15.2 | L | 5 | 30 | 3.5 | 3 | | | PEA |
| 1984 01 10.77 | S | 10.9 | VN | 41 | L | 4 | 86 | 1.75 | 2 | | | CLA |
| 1984 01 11.83 | S | 10.5 | VN | 15.2 | L | 5 | 30 | | 2 | | | PEA |
| 1984 01 12.78 | S | 10.9 | VN | 41 | L | 4 | 86 | 1.5 | 2 | | | CLA |
| 1984 01 12.81 | S | 10.4 | VN | 15.2 | L | 5 | 30 | 3.5 | 2 | | | PEA |
| 1984 01 13.82 | S | 10.6 | VN | 15.2 | L | 5 | 30 | 2.8 | 2/ | | | PEA |
| 1984 01 15.82 | S | 11.0 | VN | 31.7 | L | 8 | 79 | 2 | 4 | 0.08 | 327 | PEA |

Comet Bradfield (1984a) Cont.

| DATE (UT) | MM | MAG. | RF | AP. | T | F/ | PWR | COMA | DC | TAIL | PA | OBS. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1984 01 16.81 | S | 10.7 | VN | 15.2 | L | 5 | 30 | 5 | 3/ | 0.05 | 325 | PEA |
| 1984 01 28.76 | S | 11.4 | VN | 31 | L | 7 | 68 | 1 | 2 | | | CLA |
| 1984 01 28.80 | S | 11.3 | VN | 31.7 | L | 8 | 79 | 1.5 | 4 | 0.02 | 340 | PEA |

Periodic Comet Encke

| DATE (UT) | MM | MAG. | RF | AP. | T | F/ | PWR | COMA | DC | TAIL | PA | OBS. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1980 11 11.52 | S | 6.7 | | 15 | L | 3 | 16 | | | | | KEE |
| 1984 01 26.00 | S[ | 11.8 | A | 50 | L | | 96 | | | | | BOR |
| 1984 01 28.00 | S[ | 11.8 | A | 50 | L | | 96 | | | | | BOR |
| 1984 01 28.98 | S | 11.7 | A | 50 | L | | 96 | 2.2 | 0 | | | BOR |
| 1984 02 01.99 | S | 11.6 | A | 50 | L | | 96 | 2.3 | 0 | | | BOR |
| 1984 02 02.83 | S | 11.7 | A | 26.0 | L | 6 | 63 | 4.4 | 1 | | | MER |
| 1984 02 05.13 | S | 11.4 | AC | 20 | L | 6 | 61 | 3.0 | 1 | | | MOR |
| 1984 02 19.14 | S | 9.8 | AC | 20 | C | 10 | 78 | | 2 | | | MOR |
| 1984 02 20.10 | S | 8.8 | S | 32 | L | 4 | 45 | 2.0 | 2 | | | KEE |
| 1984 02 20.14 | S | 9.5 | AC | 20 | C | 10 | 78 | 3.1 | 2 | 0.05 | 315 | MOR |
| 1984 02 21.09 | S | 9.0 | S | 32 | L | 4 | 45 | 3.5 | 2 | | | KEE |
| 1984 02 23.00 | S | 8.8: | AA | 20.3 | L | 6 | 43 | & 7 | 0 | | | GRE |
| 1984 02 23.00 | S | 9.7 | A | 32 | L | | 68 | 2.3 | 4 | | | BOR |
| 1984 02 24.09 | S | 9.0 | S | 32 | L | 4 | 45 | 3.0 | 2 | | | KEE |
| 1984 02 24.13 | S | 8.6 | AA | 8.0 | B | | 20 | 7 | 2 | | | MOR |
| 1984 02 25.00 | S | 9.6 | A | 32 | L | | 68 | 3.1 | 4 | | | BOR |
| 1984 02 25.14 | S | 8.4 | AA | 8.0 | B | | 20 | 10 | 2 | | | MOR |
| 1984 02 26.13 | S | 8.2 | AA | 8.0 | B | | 20 | 8 | 2 | | | MOR |
| 1984 02 27.00 | S | 8.7 | A | 8.0 | B | | 20 | 4.5 | | | | BOR |
| 1984 02 27.00 | S | 9.3 | A | 32 | L | | 68 | 2.6 | 4 | | | BOR |
| 1984 02 27.01 | S | 8.7 | AA | 20.3 | L | 6 | 68 | & 4.5 | 2 | | | GRE |
| 1984 03 03.00 | S | 8.9 | A | 32 | L | | 68 | 2.2 | 5 | | | BOR |
| 1984 03 03.00 | S | 8.6 | AA | 20.3 | L | 6 | 43 | & 3 | 3/ | | | GRE |
| 1984 03 03.01 | S | 8.7 | S | 20.3 | L | 6 | 43 | | | | | GRE |
| 1984 03 03.10 | S | 8.8 | S | 32 | L | 4 | 45 | 1.8 | 3 | | | KEE |
| 1984 03 03.13 | S | 8.2 | S | 8.0 | B | | 20 | 10 | 2/ | | | MOR |
| 1984 03 04.00 | S | 8.6 | S | 8.0 | B | | 20 | & 4 | 0 | | | GRE |
| 1984 03 04.00 | M | 8.5 | S | 20.3 | L | 6 | 68 | | | | | GRE |
| 1984 03 04.00 | S | 8.4 | S | 20.3 | L | 6 | 68 | & 3.5 | 5 | | | GRE |
| 1984 03 04.01 | S | 8.5 | A | 8.0 | B | | 20 | 4 | | | | BOR |
| 1984 03 04.01 | S | 8.8 | A | 32 | L | | 68 | 2.3 | 5 | | | BOR |
| 1984 03 04.14 | S | 8.2 | S | 8.0 | B | | 20 | | 3 | | | MOR |
| 1984 03 04.14 | M | 8.6 | S | 25.6 | L | 4 | 45 | 3.2 | 6 | | | MOR |
| 1984 03 04.16 | S | 8.4 | A | 20 | C | 10 | 64 | 3.0 | 2 | | | SPR |
| 1984 03 05.15 | S | 9.0 | S | 25 | L | 4 | 32 | 2 | 2 | | | MAC |
| 1984 03 05.15 | S | 8.0 | A | 20 | C | 10 | 64 | 3.0 | 3 | | | SPR |
| 1984 03 06.14 | S | 7.9 | A | 20 | C | 10 | 64 | 3.0 | 3 | | | SPR |
| 1984 03 08.01 | S | 8.3 | NO | 32 | L | | 55 | 2.1 | 6 | | | BOR |
| 1984 03 08.01 | S | 8.4 | NO | 32 | L | | 68 | | | | | BOR |
| 1984 03 11.15 | S | 7.8 | S | 8.0 | B | | 20 | | 5 | | | MOR |
| 1984 03 11.15 | M | 8.2 | S | 20 | L | 6 | 61 | 2.4 | 8 | | | MOR |
| 1984 03 14.10 | S | 8.2 | S | 32 | L | 4 | 45 | 1.5 | 5 | | | KEE |
| 1984 03 20.14 | M | 7.3 | AA | 8.0 | B | | 20 | 3.5 | 9 | 1.17 | 53 | MOR |
| 1984 03 20.14 | S | 7.3 | S | 25 | L | 4 | 32 | 3 | 5 | | | MAC |
| 1984 03 20.15 | M | 7.3 | AA | 20 | L | 6 | 61 | 1.4 | 8 | | | MOR |
| 1984 03 23.13 | | 7.0: | | 20 | L | 6 | 61 | & 1.5 | 8 | | | MOR |

Periodic Comet Tempel 1 (1982j)

| DATE (UT) | MM | MAG. | RF | AP. | T | F/ | PWR | COMA | DC | TAIL | PA | OBS. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1983 04 16.98 | S | 10.0 | AC | 10.0 | L | | 36 | | 5/ | | | WEG |

Periodic Comet Tempel 2 (1982d)

| DATE (UT) | MM | MAG. | RF | AP. | T | F/ | PWR | COMA | DC | TAIL | PA | OBS. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1983 06 11.32 | S | 9.3 | AC | 15 | R | 5 | 31 | 4 | 2 | | | MOR03 |
| 1983 07 10.33 | S | 9.6 | AC | 15 | R | 5 | 31 | 4.5 | 3 | | | MOR03 |
| 1983 08 09.36 | S | 10.6 | AC | 15 | R | 5 | 31 | 4 | 2 | | | MOR03 |
| 1983 08 10.36 | S | 10.6 | AC | 15 | R | 5 | 31 | 5 | 2 | | | MOR03 |
| 1983 08 12.36 | S | 10.7 | AC | 15 | R | 5 | 31 | 5 | 2 | | | MOR03 |
| 1983 08 13.39 | S | 11.2 | A | 20 | C | 10 | 64 | 1.25 | 1 | | | SPR |
| 1983 08 14.46 | S | 11.0 | A | 20 | C | 10 | 64 | 1.5 | 1 | | | SPR |
| 1983 08 17.43 | S | 11.3 | A | 20 | C | 10 | 64 | 1.0 | 1 | | | SPR |
| 1983 08 18.44 | S | 10.9 | A | 20 | C | 10 | 64 | 1.5 | 1 | | | SPR |
| 1983 08 19.43 | S | 11.0 | A | 20 | C | 10 | 64 | 1.5 | 2 | | | SPR |
| 1983 08 20.45 | S | 10.9 | A | 20 | C | 10 | 64 | 1.25 | 2 | | | SPR |
| 1983 08 21.46 | S | 10.8 | A | 20 | C | 10 | 64 | 1.75 | 2 | | | SPR |
| 1983 09 03.37 | S | 10.9 | AC | 15 | R | 5 | 31 | 4.5 | 0 | | | MOR03 |
| 1983 10 07.34 | S | 11.2 | AC | 15 | R | 5 | 31 | 4 | 2 | | | MOR03 |

Periodic Comet Kopff (1982k)

| DATE (UT) | MM | MAG. | RF | AP. | T | F/ | PWR | COMA | DC | TAIL | PA | OBS. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1983 06 05.48 | M | 9.1 | A | 48 | L | 6 | 100 | 2 | 6 | | | LOW |
| 1983 06 08.00 | S | 8.6 | A | 10.0 | L | | 36 | 8 | 3/ | | | WEG |
| 1983 06 16.96 | S | 8.2 | A | 10.0 | L | | 36 | 10 | 4 | | | WEG |
| 1983 07 09.54 | S | 8.1 | A | 3 | R | 10 | 6 | | 6 | | | LOV |
| 1983 08 02.10 | S | 8.1 | AC | 15 | R | 5 | 31 | 7.5 | 2 | | | MOR03 |
| 1983 08 02.24 | S | 8.9 | A | 20 | C | 10 | 64 | 5.5 | 3 | | | SPR |
| 1983 08 03.11 | S | 8.6 | AC | 15 | R | 5 | 31 | 5.5 | 2 | | | MOR03 |
| 1983 08 04.23 | S | 8.9 | A | 20 | C | 10 | 64 | 5.0 | 4 | | | SPR |
| 1983 08 07.21 | S | 8.7 | A | 20 | C | 10 | 64 | 4.5 | 3 | | | SPR |
| 1983 08 09.08 | S | 8.3 | AC | 15 | R | 5 | 31 | 5.5 | 3 | | | MOR03 |
| 1983 08 10.09 | S | 8.3 | AC | 15 | R | 5 | 31 | 5.5 | 3 | | | MOR03 |
| 1983 08 12.21 | S | 8.6 | A | 20 | C | 10 | 64 | 4.5 | 4 | | | SPR |
| 1983 08 13.21 | S | 8.9 | A | 20 | C | 10 | 64 | 4.0 | 3 | | | SPR |
| 1983 08 14.20 | S | 9.1 | A | 20 | C | 10 | 64 | 4.0 | 3 | | | SPR |
| 1983 08 15.20 | S | 9.5 | A | 20 | C | 10 | 64 | 3.5 | 2 | | | SPR |
| 1983 08 27.44 | S | 8.9 | A | 20 | L | 7 | 50 | & 3 | 4 | | | LOV |
| 1983 08 28.44 | S | 9.1 | A | 20 | L | 7 | 50 | & 3 | 5 | | | LOV |
| 1983 09 03.06 | S | 10.0 | AC | 15 | R | 5 | 31 | 5 | 2 | | | MOR03 |
| 1983 09 28.45 | S | 11 : | A | 20 | L | 7 | 50 | | 1 | | | LOV |
| 1983 10 08.47 | S | 11.2 | A | 20 | L | 7 | 50 | & 3 | 2 | | | LOV |

Periodic Comet Churyumov-Gerasimenko (1982 VIII = 1982f)

| DATE (UT) | MM | MAG. | RF | AP. | T | F/ | PWR | COMA | DC | TAIL | PA | OBS. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1982 10 17.96 | S | 11.3 | AC | 22.5 | R | 10 | 65 | | 5/ | | | COM |
| 1982 10 24.94 | S | 11.1 | AC | 25.4 | J | 6 | 61 | 1.5 | 5/ | | | BUS01 |
| 1982 10 24.96 | S | 11.5 | AC | 25.8 | L | 5 | 64 | 1 | 6 | | | FEI |
| 1982 10 24.98 | S | 11.1 | AC | 22.5 | R | 10 | 65 | | | | | COM |
| 1982 10 28.03 | S | 11.1 | AC | 25.8 | L | 6 | 64 | 2 | 4 | | | FEI |
| 1982 10 28.04 | S | 11.0 | AC | 22.5 | R | 10 | 65 | | 5/ | | | COM |
| 1982 10 28.07 | S | 11.3 | AC | 25.4 | L | 6 | 70 | 0.5 | 6 | | | KUI |

Periodic Comet Churyumov-Gerasimenko (1982 VIII = 1982f) Cont.

| DATE (UT) | MM | MAG. | RF | AP. | T | F/ | PWR | COMA | DC | TAIL | PA | OBS. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1982 11 09.91 | S | 10.4 | AC | 22.5 | R | 10 | 65 | | 4 | | | COM |
| 1982 11 09.94 | S | 10.3 | AC | 25.4 | J | 6 | 61 | | 4 | | | COM |
| 1982 11 09.94 | S | 10.2 | AC | 25.4 | J | 6 | 61 | 2.5 | 5/ | | | BUS01 |
| 1982 11 09.96 | S | 10.2 | AC | 25.8 | L | 5 | 64 | | 6 | | | FEI |
| 1982 11 09.98 | S | 9.9 | AC | 15.6 | L | 5 | 30 | 2.5 | 6 | | | BOU |
| 1982 11 09.99 | S | 9.9 | AC | 6.0 | B | | 20 | | | | | BOU |
| 1982 11 10.99 | S | 10.6 | AC | 15.0 | L | 8 | 30 | & 3.5 | 5 | | | POI |
| 1982 11 11.95 | S | 10.3 | AC | 15.6 | L | 5 | 61 | 1.5 | | | | BOU |
| 1982 11 11.98 | S | 10.0 | AC | 15.6 | L | 5 | 30 | 2.5 | 6 | | | BOU |
| 1982 11 12.02 | S | 10.6 | AC | 15.0 | L | 8 | 60 | & 4.5 | 6 | | | POI |
| 1982 11 13.98 | B | 10.6 | AC | 25.4 | L | 6 | 70 | 2 | 7/ | | | KUI |
| 1982 11 14.00 | S | 9.8 | AC | 25.8 | L | 5 | 64 | | | | | FEI |
| 1982 11 14.01 | B | 10.3 | AC | 25.4 | J | 6 | 61 | | | | | BUS01 |
| 1982 11 14.01 | S | 9.8 | AC | 25.4 | J | 6 | 61 | 3.5 | 5/ | | | BUS |
| 1982 11 14.02 | B | 10.3 | AC | 15.0 | L | 8 | 60 | | | | | POI |
| 1982 11 14.02 | S | 10.1 | AC | 15.0 | L | 8 | 60 | & 5.5 | 6/ | | | POI |
| 1982 11 15.95 | S | 10.2 | AC | 22.5 | R | 10 | 65 | | 4/ | | | COM |
| 1982 11 15.98 | S | 9.9 | AC | 15.6 | L | 5 | 30 | 2.5 | 7 | | | BOU |
| 1982 11 16.01 | S | 10.3 | AC | 14.0 | L | 5 | 38 | | | | | BRI01 |
| 1982 11 16.02 | S | 9.8 | AC | 25.4 | J | 6 | 38 | 4 | 5/ | 0.07 | | BUS01 |
| 1982 11 16.02 | M | 10.4 | AC | 25.4 | L | 6 | 70 | 1.8 | 7 | | | KUI |
| 1982 11 19.97 | S | 10.0 | AC | 25.4 | J | 6 | 61 | 3 | 5/ | | | BUS01 |
| 1982 11 20.93 | S | 10.2 | AC | 25.4 | J | 6 | 61 | 2 | | | | BUS01 |
| 1982 11 20.93 | S | 10.0 | AC | 15.6 | L | 5 | 30 | 2 | 5 | | | BOU |
| 1982 11 20.94 | S | 10.3 | AC | 22.5 | R | 10 | 65 | | 4 | | | COM |
| 1982 11 20.99 | S | 10.3 | AC | 25.0 | L | 6 | 70 | 5 | 6 | | | POI |
| 1982 11 22.91 | S | 10.6 | AC | 15.0 | L | 8 | 60 | & 2.5 | 4 | | | POI |
| 1982 11 22.91 | B | 11.8 | AC | 15.0 | L | 8 | 60 | | | | | POI |
| 1982 11 22.93 | S | 9.8 | AC | 15.6 | L | 5 | 30 | 2.5 | 6 | | | BOU |
| 1982 11 22.93 | S | 10.3 | AC | 22.5 | R | 10 | 65 | | | | | COM |
| 1982 11 22.94 | S | 9.8 | AC | 8.0 | B | | 20 | | | | | BOU |
| 1982 11 22.94 | S | 10.2 | AC | 25.8 | L | 5 | 64 | | 6 | | | FEI |
| 1982 11 22.96 | S | 10.0 | AC | 15.6 | L | 5 | 30 | | | | | BOU |
| 1982 11 23.14 | B | 10.7 | AC | 25.4 | L | 6 | 57 | | | | | KUI |
| 1982 11 23.14 | S | 10.5 | AC | 25.4 | L | 6 | 57 | 2.2 | 5/ | | | KUI |
| 1982 12 06.90 | S | 10.2 | AC | 25.4 | J | 6 | 122 | 2 | | | | BUS01 |
| 1982 12 06.91 | S | 10.5 | AC | 15.6 | L | 5 | 60 | | 5/ | | | BOU |
| 1982 12 06.92 | S | 9.8 | AC | 25.8 | L | 5 | 64 | | 6 | | | FEI |
| 1982 12 06.96 | S | 10.3 | AC | 8.0 | B | | 15 | | | | | BRI01 |
| 1982 12 08.85 | S | 9.9 | AC | 15.6 | L | | 30 | 2.5 | 5 | | | BOU |
| 1982 12 11.91 | S | 9.7 | AC | 15.6 | L | 5 | 30 | 3 | 6 | | | BOU |
| 1982 12 11.94 | S | 9.7 | AC | 25.4 | J | 6 | 61 | 3.5 | 6 | | | BUS01 |
| 1982 12 11.94 | B | 10.3 | AC | 15.0 | L | 8 | 60 | | | | | POI |
| 1982 12 11.94 | S | 10.2 | AC | 15.0 | L | 8 | 60 | 5 | 5 | | | POI |
| 1982 12 12.17 | S | 9.4 | AC | 8.0 | B | | 20 | | | | | BOU |
| 1982 12 13.99 | S | 9.9 | AC | 11.0 | R | 10 | 17 | | | | | COM |
| 1982 12 16.82 | S | 9.6 | AC | 15.6 | L | 5 | 30 | 3 | 5 | | | BOU |
| 1982 12 16.84 | S | 9.4 | AC | 8.0 | B | | 20 | 4 | 3 | | | BOU |
| 1982 12 16.91 | M | 9.8 | AC | 25.4 | L | 6 | 57 | 3 | 8 | | | KUI |
| 1982 12 18.86 | S | 9.5 | AC | 15.6 | L | 5 | 30 | 3 | 6 | | | BOU |
| 1982 12 18.87 | B | 9.8 | AC | 15.6 | L | 5 | 30 | | | | | BOU |
| 1982 12 18.94 | S | 10.0 | AC | 11.0 | R | 10 | 17 | | 5 | | | COM |
| 1982 12 18.97 | M | 9.8 | AC | 25.4 | L | 6 | 57 | 2.5 | 7 | | | KUI |
| 1982 12 18.98 | S | 9.9 | AC | 11.0 | R | 10 | 17 | | | | | FEI |
| 1982 12 21.89 | S | 9.6 | AC | 15.6 | L | 5 | 30 | | | | | BOU |

Periodic Comet Churyumov-Gerasimenko (1982 VIII = 1982f) Cont.

| DATE (UT) | MM | MAG. | RF | AP. | T | F/ | PWR | COMA | DC | TAIL | PA | OBS. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1982 12 21.94 | S | 10.2 | AC | 11.0 | R | 10 | 17 | | 4 | | | COM |
| 1982 12 22.02 | S | 9.7 | AC | 11.0 | L | 6 | 30 | | | | | FEI |
| 1982 12 22.06 | M | 9.5 | AC | 25.4 | L | 6 | | 2.8 | 7/ | | | KUI |
| 1982 12 22.97 | S | 9.5 | AC | 15.6 | L | 5 | 30 | 3 | 5 | | | BOU |
| 1982 12 22.98 | S | 9.7 | AC | 22.5 | R | 10 | 65 | | 4 | | | COM |
| 1982 12 23.98 | B | 11.0 | AC | 15.0 | L | 8 | 60 | | | | | POI |
| 1982 12 23.98 | S | 10.6 | AC | 15.0 | L | 8 | 60 | 3 | 4 | | | POI |
| 1982 12 23.99 | S | 9.7 | AC | 15.5 | L | 5 | 50 | | 6 | | | FEI |
| 1982 12 24.07 | M | 9.6 | AC | 25.4 | L | 6 | 57 | 2.5 | 7 | | | KUI |
| 1983 01 04.84 | S | 9.9 | AC | 15.6 | L | 5 | 30 | 3 | 4/ | | | BUS01 |
| 1983 01 04.88 | S | 9.5 | AC | 15.6 | L | 5 | 29 | 3 | 4/ | | | BOU |
| 1983 01 04.91 | S | 10.0 | AC | 11.0 | R | 10 | 17 | | 4 | | | COM |
| 1983 01 07.87 | S | 9.6 | AC | 15.6 | L | 5 | 29 | 3 | 4 | | | BOU |
| 1983 01 08.76 | S | 11.1 | AC | 15.0 | L | 8 | 60 | 2 | 2/ | | | POI |
| 1983 01 09.90 | S | 10.9 | AC | 15.0 | L | 8 | 60 | 3 | 4 | | | POI |
| 1983 01 09.90 | B | 11.0 | AC | 15.0 | L | 8 | 60 | | | | | POI |
| 1983 01 09.91 | S | 10.0 | AC | 25.8 | L | 5 | 64 | | 5 | | | FEI |
| 1983 01 09.98 | M | 10.4 | AC | 25.4 | L | 6 | 57 | 1.5 | 8 | | | KUI |
| 1983 01 12.95 | S | 10.7 | AC | 15.0 | L | 8 | 60 | 2 | 3 | | | POI |
| 1983 01 18.86 | S | 10.8 | AC | 15.0 | L | 8 | 60 | 3 | 2/ | | | POI |
| 1983 01 18.86 | B | 11.0 | AC | 15.0 | L | 8 | 60 | | | | | POI |
| 1983 01 18.90 | S | 10.6 | AC | 11.0 | R | 10 | 17 | | 3/ | | | COM |
| 1983 01 18.90 | S | 10.3 | AC | 15.6 | L | 5 | 29 | | 2/ | | | BOU |
| 1983 01 19.88 | B | 11.0 | AC | 15.0 | L | 8 | 60 | | | | | POI |
| 1983 01 19.88 | S | 10.7 | AC | 15.0 | L | 8 | 60 | & 3.5 | 2/ | | | POI |
| 1983 01 19.90 | S | 10.4 | AC | 25.4 | J | 6 | 61 | 3 | 4 | | | BUS01 |
| 1983 01 20.13 | S | 10.5 | AC | 25.4 | L | 6 | 57 | 2 | 4 | | | KUI |
| 1983 02 01.86 | S | 11.7 | AC | 25.8 | L | 5 | 64 | | | | | FEI |
| 1983 02 02.83 | S | 10.7 | AC | 15.6 | L | 5 | 29 | 2 | 2 | | | BOU |
| 1983 02 02.85 | S | 11.4 | AC | 25.8 | L | 5 | 64 | | 2/ | | | FEI |
| 1983 02 02.89 | S | 11.6 | AC | 22.5 | R | 10 | 65 | | 3 | | | COM |
| 1983 02 03.84 | S | 11.5 | AC | 25.8 | L | 5 | 64 | | | | | FEI |
| 1983 02 03.93 | S | 10.9 | AC | 15.6 | L | 5 | 29 | 2 | 1 | | | BOU |
| 1983 02 03.97 | M | 10.9 | AC | 25.4 | L | 6 | 70 | 1.8 | 5/ | | | KUI |
| 1983 02 13.81 | S | 10.8 | AC | 25.4 | J | 6 | 61 | 5 | 1 | | | BUS01 |
| 1983 02 13.81 | S | 11.4 | AC | 25.4 | J | 6 | 95 | 3 | 1 | | | BUS01 |
| 1983 02 13.87 | S | 11.8 | AC | 22.5 | R | 10 | 65 | | 3 | | | COM |
| 1983 02 17.91 | S | 11.9 | AC | 22.5 | R | 10 | 65 | | 2/ | | | COM |
| 1983 02 17.91 | S | 10.9 | AC | 25.4 | J | 6 | 61 | 5 | 1 | | | BUS01 |
| 1983 02 17.92 | S | 10.8 | AC | 25.4 | J | | 59 | 3 | 1/ | | | BOU |
| 1983 02 17.95 | S | 11.5 | AC | 25.4 | L | 6 | 57 | 2 | | | | KUI |
| 1983 03 02.83 | S | 11.6 | AC | 25.4 | J | | 59 | 4 | 0/ | | | BUS01 |
| 1983 03 02.83 | S | 11.7 | AC | 25.4 | J | | 59 | 4 | 0/ | | | BOU |
| 1983 03 04.95 | S | 11.2 | AC | 25.4 | J | | 59 | > 5.5 | 0/ | | | BUS01 |
| 1983 03 04.95 | S | 11.5 | AC | 25.4 | J | | 59 | & 3.5 | 0/ | | | BOU |
| 1983 03 11.87 | S | 12.9 | AC | 22.5 | R | 10 | 65 | | 1/ | | | COM |
| 1983 03 11.94 | S | 12.7 | AC | 25.4 | J | | 250 | | | | | POI |

Periodic Comet Wild 2 (1983s)

| DATE (UT) | MM | MAG. | RF | AP. | T | F/ | PWR | COMA | DC | TAIL | PA | OBS. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1984 04 04.20 | S | 13.4 | AC | 25.6 | L | 4 | 110 | 0.9 | 3 | | | MOR |

Periodic Comet Crommelin (1983n)

| DATE (UT) | MM | MAG. | RF | AP. | T | F/ | PWR | COMA | DC | TAIL | PA | OBS. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1983 12 29.76 | S | 12.3 | A | 26.0 | L | 6 | 63 | 2.5 | 1 | | | MER |
| 1983 12 29.8 | | 12.9: | | | | | | & 1 | | | | VER02 |
| 1983 12 30.99 | S[ | 12.3 | A | 50 | L | | 157 | | | | | BOR |
| 1984 01 21.98 | S | 11.4 | A | 32 | L | | 68 | 2.0 | 0 | | | BOR |
| 1984 01 25.79 | S | 10.9 | A | 26.0 | L | 6 | 63 | & 3 | 1 | | | MER |
| 1984 01 25.98 | S | 10.4 | A | 32 | L | | 68 | 1.8 | 1/ | | | BOR |
| 1984 01 27.98 | | | | 50 | L | | 96 | 2.2 | 2 | | | BOR |
| 1984 01 27.98 | S | 9.8 | A | 32 | L | | 68 | 2.7 | 3 | | | BOR |
| 1984 01 28.99 | S | 10.0 | A | 32 | L | | 68 | 2.2 | 4 | | | BOR |
| 1984 01 29.15 | S | 10.6 | S | 25 | L | 4 | 32 | 1.5 | 2 | | | MAC |
| 1984 01 30.07 | S | 9.8 | S | 32 | L | 4 | 78 | 1.0 | 3 | | | KEE |
| 1984 02 02.00 | S | 9.6 | A | 32 | L | | 68 | 2.0 | 4 | | | BOR |
| 1984 02 04.14 | S | 9.1 | A | 20 | C | 10 | 81 | 3.0 | 4 | | | SPR |
| 1984 02 05.00 | S | 9.2 | A | 32 | L | | 68 | 2.4 | 4 | | | BOR |
| 1984 02 05.09 | S | 9.4 | S | 32 | L | 4 | 78 | 2.0 | 3 | | | KEE |
| 1984 02 05.14 | M | 9.3 | AC | 20 | L | 6 | 61 | 3.0 | 5/ | ? | 280 | MOR |
| 1984 02 05.79 | S | 9.3 | A | 26.0 | L | 6 | 39 | & 4 | 3 | | | MER |
| 1984 02 08.00 | S | 8.8 | A | 32 | L | | 68 | 2 | 4/ | | | BOR |
| 1984 02 08.78 | S | 9.1 | S | 15.0 | L | 5 | 25 | 6.0 | 2 | 0.1 | 58 | MER |
| 1984 02 08.99 | S | 8.9 | A | 32 | L | | 68 | 2.0 | 5 | | | BOR |
| 1984 02 09.77 | S | 9.1 | S | 26.0 | L | 6 | 39 | 6.6 | 2 | | 28 | MER |
| 1984 02 10.77 | S | 9.0 | S | 26.0 | L | 6 | 39 | & 6.0 | 2 | | | MER |
| 1984 02 12.77 | S | 8.7 | S | 26.0 | L | 6 | 39 | & 6.0 | 3 | | 28 | MER |
| 1984 02 13.77 | S | 8.6 | S | 26.0 | L | 6 | 39 | & 8.0 | 3 | | 28 | MER |
| 1984 02 14.77 | S | 8.5 | S | 26.0 | L | 6 | 39 | & 7.0 | 3 | | | MER |
| 1984 02 15.15 | S | 8.5: | S | 20 | C | 10 | 78 | | | | | MOR |
| 1984 02 17.77 | | | | 26.0 | L | 6 | 130 | | | 0.03 | 352 | MER |
| 1984 02 17.77 | S | 8.3 | S | 26.0 | L | 6 | 39 | & 5.0 | 3 | | | MER |
| 1984 02 18.77 | S | 8.1 | S | 26.0 | L | 6 | 39 | 7.5 | 3 | | | MER |
| 1984 02 18.78 | | | | 26.0 | L | 6 | 130 | | | 0.08 | 84 | MER |
| 1984 02 18.78 | | | | 26.0 | L | 6 | 63 | | | 0.09 | 340 | MER |
| 1984 02 19.10 | S | 8.7 | S | 32 | L | 4 | 45 | 1.8 | 3 | | | KEE |
| 1984 02 19.16 | M | 8.2 | AA | 20 | C | 10 | 78 | | | | | MOR |
| 1984 02 19.16 | M | 8.2 | AA | 20 | L | 6 | 61 | 2.7 | 7 | | | MOR |
| 1984 02 19.77 | S | 8.1 | S | 26.0 | L | 6 | 39 | & 6.0 | 4 | | | MER |
| 1984 02 19.78 | | | | 26.0 | L | 6 | 130 | | | 0.08 | 84 | MER |
| 1984 02 19.95 | B | 8.9 | S | 7.0 | B | | 10 | 1.4 | 4 | | | DEA |
| 1984 02 20.11 | S | 8.8 | S | 32 | L | 4 | 45 | 1.8 | 4 | | | KEE |
| 1984 02 20.15 | S | 8.0 | AA | 8.0 | B | | 20 | 6 | 4 | 0.33 | 63 | MOR |
| 1984 02 20.16 | M | 8.2 | AA | 20 | C | 10 | 78 | 1.6 | 6/ | 0.33 | 63 | MOR |
| 1984 02 21.10 | S | 8.2 | S | 32 | L | 4 | 45 | 1.5 | 5 | | | KEE |
| 1984 02 21.12 | S | 7.8 | S | 15 | L | 3 | 16 | | | | | KEE |
| 1984 02 21.94 | B | 8.4 | S | 7.0 | B | | 10 | 1.4 | 4 | | | DEA |
| 1984 02 23.01 | S | 8.3 | NO | 5.0 | B | | 10 | 5 | | | | BOR |
| 1984 02 23.01 | B | 8.7 | NO | 8.0 | B | | 20 | | | | | BOR |
| 1984 02 23.01 | | | | 32 | L | | 68 | 2.7 | 6/ | | | BOR |
| 1984 02 23.01 | S | 8.5 | NO | 8.0 | B | | 20 | 3.5 | 6 | | | BOR |
| 1984 02 23.02 | S | 8.0 | AA | 8.0 | B | | 20 | & 7 | 5 | | | GRE |
| 1984 02 23.02 | S | 8.0: | AA | 5.0 | B | | 7 | | | | | GRE |
| 1984 02 23.03 | M | 8.1 | AA | 20.3 | L | 6 | 43 | | | | | GRE |
| 1984 02 23.03 | S | 8.1 | AA | 20.3 | L | 6 | 43 | & 5 | 6/ | | | GRE |
| 1984 02 23.79 | | | | 26.0 | L | 6 | 130 | | | 0.08 | 233 | MER |
| 1984 02 23.79 | S | 8.2 | S | 26.0 | L | 6 | 39 | & 7.5 | 3 | 0.10 | 98 | MER |
| 1984 02 23.80 | S | 8.1 | S | 9.0 | L | 9 | 28 | | | | | MER |
| 1984 02 24.11 | S | 8.3 | S | 32 | L | 4 | 45 | 2.5 | 5 | | | KEE |

Periodic Comet Crommelin (1983n) Cont.

| DATE (UT) | MM | MAG. | RF | AP. | T | F/ | PWR | COMA | DC | TAIL | PA | OBS. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1984 02 24.16 | M | 8.1 | AA | 8.0 | B | | 20 | 7 | 5 | | | MOR |
| 1984 02 25.02 | | | | 32 | L | | 68 | 4.5 | 6 | | | BOR |
| 1984 02 25.02 | S | 8.2 | A | 8.0 | B | | 20 | 6 | 5 | | | BOR |
| 1984 02 25.16 | M | 8.1 | AA | 8.0 | B | | 20 | 7 | 7 | | | MOR |
| 1984 02 26.15 | M | 8.5 | S | 25.6 | L | 4 | 45 | 2.5 | 7/ | 0.17 | 55 | MOR |
| 1984 02 26.16 | M | 8.2 | AA | 8.0 | B | | 20 | 5 | 6/ | | | MOR |
| 1984 02 26.94 | B | 8.4 | S | 7.0 | B | | 10 | 2.2 | 4 | | | DEA |
| 1984 02 27.02 | S | 8.2 | A | 8.0 | B | | 20 | 3.5 | 5 | | | BOR |
| 1984 02 27.02 | | | | 32 | L | | 68 | 1.8 | 6 | | | BOR |
| 1984 02 27.03 | S | 8.1 | AA | 20.3 | L | 6 | 68 | & 5 | 4/ | | | GRE |
| 1984 02 27.03 | S | 8.0 | AA | 8.0 | B | | 20 | & 5 | | | | GRE |
| 1984 03 01.02 | S | 8.7: | S | 8.0 | B | | 20 | & 4 | 0 | | | GRE |
| 1984 03 01.97 | B | 8.4 | S | 7.0 | B | | 10 | 2.3 | 4 | | | DEA |
| 1984 03 02.02 | S | 8.4: | S | 8.0 | B | | 20 | & 4 | 0 | | | GRE |
| 1984 03 03.02 | S | 8.5 | A | 8.0 | B | | 20 | 3.5 | 4 | | | BOR |
| 1984 03 03.02 | M | 8.3 | AA | 20.3 | L | 6 | 43 | | | | | GRE |
| 1984 03 03.02 | | | | 32 | L | | 68 | 2.9 | 5/ | | | BOR |
| 1984 03 03.02 | S | 8.3 | AA | 20.3 | L | 6 | 43 | & 6 | 4/ | | | GRE |
| 1984 03 03.11 | S | 8.1 | S | 32 | L | 4 | 45 | 2.7 | 5 | | | KEE |
| 1984 03 03.12 | S | 7.7 | S | 15 | L | 3 | 16 | | | | | KEE |
| 1984 03 03.15 | S | 8.3 | S | 8.0 | B | | 20 | 4.5 | 6 | | | MOR |
| 1984 03 03.15 | S | 7.8 | A | 20 | C | 10 | 43 | 5.0 | 5 | | | SPR |
| 1984 03 03.96 | B | 8.5 | S | 7.0 | B | | 10 | 2.3 | 4 | | | DEA |
| 1984 03 04.02 | S | 8.1 | AA | 20.3 | L | 6 | 43 | & 7.5 | 4/ | | | GRE |
| 1984 03 04.02 | | | | 32 | L | | 68 | 3.2 | 5 | | | BOR |
| 1984 03 04.02 | M | 8.1 | AA | 20.3 | L | 6 | 43 | | | | | GRE |
| 1984 03 04.02 | S | 8.5 | A | 8.0 | B | | 20 | 3.5 | 3 | | | BOR |
| 1984 03 04.02 | S | 8.1 | AA | 8.0 | B | | 20 | | | | | GRE |
| 1984 03 04.03 | S | 8.1 | AA | 20.3 | L | 6 | 68 | & 6 | 4/ | | | GRE |
| 1984 03 04.03 | M | 8.2 | AA | 20.3 | L | 6 | 68 | | | | | GRE |
| 1984 03 04.16 | M | 8.4 | S | 8.0 | B | | 20 | 3.6 | 5 | 0.05 | 100 | MOR |
| 1984 03 04.16 | S | 7.4 | A | 20 | C | 10 | 64 | 4.5 | 4 | | | SPR |
| 1984 03 04.81 | S | 8.0 | S | 15.0 | L | 5 | 25 | & 7.5 | 4 | 0.06 | 100 | MER |
| 1984 03 05.00 | S | 8.2 | AA | 22.9 | R | 12 | 96 | & 4 | 5 | | | GRE |
| 1984 03 05.16 | S | 7.5 | A | 20 | C | 10 | 64 | 4.0 | 4 | | | SPR |
| 1984 03 05.17 | S | 8.6 | S | 25 | L | 4 | 32 | 4 | 5 | | | MAC |
| 1984 03 05.80 | S | 8.2 | S | 26.0 | L | 6 | 39 | & 7.0 | 3/ | 0.03 | 111 | MER |
| 1984 03 05.81 | S | 8.1 | S | 9.0 | L | 9 | 28 | | 3 | | | MER |
| 1984 03 06.13 | S | 8.2 | S | 32 | L | 4 | 45 | 3.0 | 5 | | | KEE |
| 1984 03 06.15 | S | 7.6 | A | 20 | C | 10 | 64 | 6.0 | 3 | | | SPR |
| 1984 03 06.15 | S | 8.3 | S | 8.0 | B | | 20 | | | | | MOR |
| 1984 03 06.79 | S | 8.1 | S | 26.0 | L | 6 | 39 | & 6.0 | 3 | 0.02 | 119 | MER |
| 1984 03 08.01 | S | 8.3 | S | 22.9 | R | 12 | 152 | & 2.3 | 2/ | | | GRE |
| 1984 03 08.03 | S | 8.4 | A | 8.0 | B | | 20 | 5 | 3 | | | BOR |
| 1984 03 08.03 | S | 8.8 | A | 32 | L | | 68 | 3.5 | 3/ | | | BOR |
| 1984 03 08.79 | S | 8.3 | S | 26.0 | L | 6 | 39 | & 5.0 | 3 | 0.02 | 104 | MER |
| 1984 03 11.18 | S | 8.7 | S | 20 | L | 6 | 61 | 4.5 | 3 | | | MOR |
| 1984 03 14.13 | S | 8.3 | S | 32 | L | 4 | 45 | 3.7 | 4 | | | KEE |
| 1984 03 19.93 | B | 8.7 | S | 7.0 | B | | 10 | 2.1 | 2 | | | DEA |
| 1984 03 20.17 | S | 8.2 | AA | 8.0 | B | | 20 | 10 | 3 | | | MOR |
| 1984 03 20.17 | M | 8.5 | S | 20 | L | 6 | 61 | 5 | 4 | | | MOR |
| 1984 03 20.93 | B | 8.7 | S | 7.0 | B | | 10 | 2.1 | 2 | | | DEA |
| 1984 03 23.16 | M | 8.9 | S | 20 | L | 6 | 61 | | 3 | | | MOR |
| 1984 03 23.16 | S | 8.6 | AA | 8.0 | B | | 20 | 8 | 2/ | | | MOR |
| 1984 03 23.95 | B | 8.4 | S | 7.0 | B | | 10 | 4.5 | 3 | | | DEA |

Periodic Comet Crommelin (1983n) Cont.

| DATE (UT) | MM | MAG. | RF | AP. | T | F/ | PWR | COMA | DC | TAIL | PA | OBS. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1984 03 24.95 | S | 9.2 | S | 7.0 | B | | 10 | 2.0 | | | | DEA |
| 1984 03 25.16 | M | 8.5 | S | 25.6 | L | 4 | 45 | & 7 | 3 | ? | 270 | GRE |
| 1984 03 25.17 | S | 8.7 | AA | 8.0 | B | | 20 | & 8.4 | 0 | | | GRE |
| 1984 03 25.18 | S | 8.9 | AA | 8.0 | B | | 20 | 6.7 | 1/ | | | MOR |
| 1984 03 25.18 | S | 8.9 | AA | 25.6 | L | 4 | 45 | | | | | GRE |
| 1984 03 25.18 | S | 9.2 | AA | 25.6 | L | 4 | 45 | 3.4 | 2 | | | MOR |
| 1984 03 28.17 | S | 8.7 | AA | 8.0 | B | | 20 | & 8 | 0/ | | | GRE |
| 1984 03 28.18 | S | 8.7 | AA | 8.0 | B | | 20 | 9 | 1/ | | | MOR |
| 1984 03 28.18 | S | 8.9 | AA | 25.6 | L | 4 | 45 | & 6.4 | 2/ | | | GRE |
| 1984 03 28.18 | M | 8.9 | AA | 26.6 | L | 4 | 45 | 7 | 2/ | | | MOR |
| 1984 03 28.19 | M | 9.0 | AA | 25.6 | L | 4 | 45 | | | | | GRE |
| 1984 03 28.94 | B | 8.9 | S | 7.0 | B | | 10 | 3.2 | 4 | | | DEA |
| 1984 03 29.17 | S | 8.7: | AA | 5.0 | B | | 12 | & 9.5 | 0 | | | GRE |
| 1984 03 29.95 | B | 9.4 | S | 7.0 | B | | 10 | 3.2 | 4 | | | DEA |
| 1984 03 31.13 | S | 9.2 | S | 15 | R | 10 | 76 | | 1 | | | MOR |
| 1984 04 03.18 | S | 9.9 | AC | 20 | L | 6 | 61 | 4.0 | 1 | | | MOR |
| 1984 04 04.18 | S | 9.8 | AC | 25.6 | L | 4 | 67 | 5.5 | 1/ | | | MOR |

Periodic Comet IRAS (1983j)

| DATE (UT) | MM | MAG. | RF | AP. | T | F/ | PWR | COMA | DC | TAIL | PA | OBS. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1983 08 15.05 | S | 13.0 | A | 25.4 | J | 6 | 73 | 1 | 3/ | | | BUS01 |
| 1983 08 15.05 | S | 12.8 | A | 25.4 | J | 6 | 73 | & 1.25 | 0/ | | | BOU |
| 1983 08 20.46 | S | 11.6 | A | 20 | C | 10 | 102 | 1.0 | 5 | | | SPR |
| 1983 08 21.45 | S | 11.2 | A | 20 | C | 10 | 64 | 1.0 | 5 | | | SPR |
| 1983 09 04.29 | S | 12.0 | AC | 15 | R | 5 | 31 | 2.5 | 1 | | | MOR03 |
| 1983 09 06.99 | S | 12.0 | A | 25.4 | L | 6 | 70 | 1 | | | | KUI |
| 1983 09 11.02 | S | 11.2 | A | 15.6 | L | 5 | 36 | | | | | BOU |
| 1983 09 11.03 | S | 11.2 | A | 25.4 | J | 6 | 59 | & 1.75 | 3/ | | | BUS01 |
| 1983 09 11.04 | S | 11.2 | A | 25.4 | J | 6 | 59 | 1.5 | 3/ | | | BOU |
| 1983 09 16.07 | M | 11.8 | A | 25.4 | L | 6 | 70 | 0.8 | 5 | | | KUI |
| 1983 09 18.05 | S | 11.1 | A | 25.4 | J | 6 | 59 | | 2/ | | | BUS01 |
| 1983 09 18.05 | S | 11.0 | A | 25.4 | J | 6 | 59 | | 2/ | | | BOU |
| 1983 09 19.10 | S | 11.0 | A | 15.6 | L | 5 | 36 | & 1.75 | 4 | | | BOU |
| 1983 09 30.84 | S | 11.4 | A | 25.4 | J | 6 | 59 | 2 | 2 | | | BOU |
| 1983 09 30.85 | S | 11.6 | A | 25.4 | J | 6 | 59 | 2 | 3 | | | BUS01 |
| 1983 09 30.85 | B | 12.2 | A | 25.4 | J | 6 | 59 | | | | | BUS01 |
| 1983 09 30.86 | S | 13.5: | A | 25.4 | J | 6 | 90 | | | | | BUS01 |
| 1983 09 30.86 | B | 14.5: | A | 25.4 | J | 6 | 90 | | | | | BUS01 |
| 1983 10 05.99 | S | 12.4 | A | 25.4 | L | 6 | 70 | 0.8 | 5 | | | KUI |
| 1983 10 27.76 | S | 12.4 | A | 26.0 | L | 6 | 63 | & 2 | 3 | | | MER |

Periodic Comet Hartley-IRAS (1983v)

| DATE (UT) | MM | MAG. | RF | AP. | T | F/ | PWR | COMA | DC | TAIL | PA | OBS. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1983 12 09.02 | S | 10.9: | L | 22.9 | R | 12 | 152 | & 1 | 0/ | | | GRE |
| 1983 12 28.73 | S | 10.8 | A | 26.0 | L | 6 | 63 | 4.5 | 3 | | | MER |
| 1983 12 29.73 | S | 10.8 | A | 26.0 | L | 6 | 63 | 4.0 | 3 | | | MER |
| 1984 02 05.56 | S | 10.4 | S | 25 | L | 4 | 32 | 2 | 2 | | | MAC |
| 1984 02 05.57 | S | 10.3 | AC | 20 | L | 6 | 61 | 2.1 | 3 | | | MOR |
| 1984 02 11.56 | S | 9.9 | AC | 20 | L | 6 | 61 | 2.2 | 2/ | 0.25 | 200 | MOR |
| 1984 02 23.42 | S | 7.8 | NO | 8.0 | B | | 20 | 5.5 | 3/ | | | BOR |
| 1984 02 23.42 | B | 7.9 | NO | 8.0 | B | | 20 | | | | | BOR |
| 1984 02 23.42 | S | 7.8 | NO | 5.0 | B | | 10 | 6.5 | | | | BOR |
| 1984 02 23.42 | | | | 32 | L | | 68 | 3.0 | 5 | | | BOR |

Periodic Comet Hartley-IRAS (1983v) Cont.

| DATE (UT) | MM | MAG. | RF | AP. | T | F/ | PWR | COMA | DC | TAIL | PA | OBS. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1984 02 24.51 | M | 7.6 | AA | 8.0 | B | | 20 | 7 | 5 | | | MOR |
| 1984 02 24.52 | S | 7.4 | AA | 5.0 | B | | 10 | | | | | MOR |
| 1984 02 24.55 | M | 7.8 | AA | 20 | L | 6 | 61 | 6 | 5 | 0.17 | 195 | MOR |
| 1984 02 25.39 | S | 7.7 | AA | 20.3 | L | 6 | 68 | & 7 | 2/ | | | GRE |
| 1984 02 25.56 | S | 9.2 | S | 25 | L | 4 | 32 | 3 | 2 | | | MAC |
| 1984 02 26.43 | S | 8.0 | NO | 8.0 | B | | 20 | 5.0 | 4 | | | BOR |
| 1984 02 27.42 | M | 8.9 | AA | 22.9 | R | 12 | 152 | | | | | GRE |
| 1984 02 27.42 | S | 8.6 | NO | 5.0 | B | | 10 | | | | | BOR |
| 1984 02 27.42 | S | 8.9 | AA | 22.9 | R | 12 | 152 | & 4 | 4/ | ?0.17 | 80 | GRE |
| 1984 02 27.42 | | | | 32 | L | | 68 | 4.0 | 6 | | | BOR |
| 1984 02 27.42 | S | 8.6 | AA | 8.0 | B | | 20 | & 5 | 0 | | | GRE |
| 1984 02 27.42 | S | 8.8 | NO | 8.0 | B | | 20 | 4.0 | 5 | | | BOR |
| 1984 02 27.44 | S | 8.5 | AA | 8.0 | B | | 20 | | | | | GRE |
| 1984 02 27.52 | S | 8.4 | S | 32 | L | 4 | 45 | 1.8 | 3 | | | KEE |
| 1984 02 29.53 | M | 8.9 | AA | 25.6 | L | 4 | 45 | 4.3 | 4/ | &0.17 | 190 | MOR |
| 1984 02 29.55 | S | 8.5 | AA | 8.0 | B | | 20 | 6 | 3/ | | | MOR |
| 1984 03 01.40 | S | 8.8 | AA | 22.9 | R | 12 | 152 | & 2.4 | 2 | | | GRE |
| 1984 03 01.41 | S | 8.8 | NO | 8.0 | B | | 20 | 5.0 | 4/ | | | BOR |
| 1984 03 01.42 | S | 8.6 | AA | 8.0 | B | | 20 | & 3.6 | 0/ | | | GRE |
| 1984 03 02.41 | S | 8.8 | AA | 22.9 | R | 12 | 152 | & 3 | 2 | | | GRE |
| 1984 03 02.42 | | | | 32 | L | | 68 | 2.7 | 5 | | | BOR |
| 1984 03 02.42 | S | 8.6 | AA | 8.0 | B | | 20 | & 3.5 | 0 | | | GRE |
| 1984 03 02.42 | S | 8.7 | NO | 8.0 | B | | 20 | 5.0 | 4 | | | BOR |
| 1984 03 03.40 | S | 8.7 | S | 22.9 | R | 12 | 152 | & 2.5 | 3/ | | | GRE |
| 1984 03 07.55 | S | 9.5 | AA | 25.6 | L | 4 | 45 | 3.5 | 2/ | | | MOR |
| 1984 03 08.37 | M | 8.8 | S | 20.3 | L | 6 | 43 | | | | | GRE |
| 1984 03 08.37 | S | 8.9 | S | 20.3 | L | 6 | 43 | & 5.1 | 4 | | | GRE |
| 1984 03 08.39 | M | 8.5 | AA | 20.3 | L | 6 | 43 | | | | | GRE |
| 1984 03 08.39 | S | 8.6 | AA | 20.3 | L | 6 | 43 | | | | | GRE |
| 1984 03 08.40 | S | 8.4 | AA | 8.0 | B | | 20 | & 5.7 | 2/ | | | GRE |
| 1984 03 08.40 | M | 8.3 | AA | 8.0 | B | | 20 | | | | | GRE |
| 1984 03 08.41 | S | 9.3 | NO | 8.0 | B | | 20 | 5.0 | 3/ | | | BOR |
| 1984 03 08.41 | S | 8.5 | AA | 20.3 | L | 6 | 68 | | | | | GRE |
| 1984 03 08.41 | S | 9.4 | A | 8.0 | B | | 20 | | | | | BOR |
| 1984 03 08.41 | M | 8.5 | AA | 20.3 | L | 6 | 68 | & 5.7 | 4/ | | | GRE |
| 1984 03 10.18 | S | 10.3: | AC | 20.0 | C | 10 | 100 | 1.5 | 2 | | | ZAN |
| 1984 03 11.18 | S | 10.2 | AC | 20.0 | C | 10 | 50 | 2.0 | 2 | | | ZAN |
| 1984 03 11.54 | M | 9.5 | AC | 25.6 | L | 4 | 67 | 4.3 | 4 | | | MOR |
| 1984 03 11.55 | S | 10.2 | S | 25 | L | 4 | 32 | 2 | 2 | | | MAC |
| 1984 03 25.36 | S | 9.0 | S | 25.6 | L | 4 | 45 | & 3.3 | 3/ | | | GRE |
| 1984 03 25.38 | S | 9.0 | S | 25.6 | L | 4 | 67 | | | | | GRE |
| 1984 03 25.38 | S | 9.4: | S | 25.6 | L | 4 | 67 | & 3.0 | 3 | | | MOR |
| 1984 03 30.24 | S | 10.0 | A | 20 | C | 10 | 64 | 4.5 | 2 | | | SPR |
| 1984 03 31.22 | S | 10.4 | A | 20 | C | 10 | 64 | 4.0 | 2 | | | SPR |
| 1984 04 06.35 | S | 9.5 | S | 32 | L | 4 | 42 | 3.0 | 3 | | | KEE |
| 1984 04 08.44 | S | 9.3 | NP | 25.6 | L | 4 | 45 | 3.5 | 2 | | | MOR |

**********

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.

# RECENT NEWS CONCERNING COMETS

Daniel W. E. Green
Harvard-Smithsonian Center for Astrophysics

Since this column was written for the January issue, Kenneth Russell has discovered his 4th short-period comet, and 2 other periodic comets have been recovered by other observers. Using the 1.24-m (49-inch) Schmidt telescope of the U.K. Schmidt Telescope Unit (UKSTU) in Australia, Russell found comet 1984d as an object of 13th or 14th magnitude, with a noticeable short tail, on plates exposed on March 2, 4, and 7. Subsequent observations by Jim Gibson at Palomar enabled Brian G. Marsden, Smithsonian Astrophysical Observatory, to calculate an orbit of 6.4 years, with perihelion having occurred on 1984 Jan. 6. The comet, now known as P/Russell 4, was followed photographically by several observatories through April 4, when observers at Lowell Observatory in Arizona found the comet at estimated total magnitude 16.2 on exposures taken there.

Several visual observers attempted to find P/Russell 4 during February and March, but no positive data have been reported. This author believes that he probably glimpsed comet 1984d with the 9-inch Clark refractor at Harvard College Observatory (Cambridge, Mass.) on March 10.3 UT at total visual magnitude 12.8-13.0, as a very difficult, small (perhaps 1′ coma) object at 153x. [Page 34 has an ephemeris for comet 1983d.]

The current practice adopted by the IAU for cases where more than one short-period comet have the same name, after the discoverer(s), is that of adding Arabic numerals after the name(s) of the discoverer(s); for example, P/Wild 1, P/Wild 2, and P/Wild 3, for the three periodic comets discovered by Paul Wild.

This is the first time that 4 periodic comets have had the same name (Russell), although Galle, in his 1894 catalogue, stated that Tempel's fourth short-period comet should be given the name P/Tempel 4 upon its first recovery. However, P/Tempel 3 was rediscovered by Swift, and is now known as P/Tempel-Swift, and Tempel's 4th periodic comet is now called P/Tempel-Tuttle. The custom then was to wait until a new comet was observed at its second apparition before it was called periodic. Five other cases exist where 3 periodic comets share the same name(s) of the discoverer(s): Gehrels, Wild, Schwassmann-Wachmann, Neujmin, and Barnard. Only the first two of these observers are currently active, with the potential for still finding a fourth short-period comet with the same name.

The two other comets that have been assigned provisional letter designations in 1984 are P/Neujmin 1 (1984c) and P/Giacobini-Zinner (1984e). P/Neujmin 1 is interesting, as is P/Arend-Rigaux, in being almost asteroidal in appearance. In fact, a coma has only been seen under very favorable conditions, when the comet is relatively close to the earth; we may be actually looking at a true cometary nucleus, uncontaminated by coma, when observing P/Neujmin 1 while it is far from perihelion. P/Neujmin 1 and P/Arend-Rigaux both show no evidence of non-gravitational forces in their motions, and these are the two periodic comets (with orbital periods < 20 years) which are the most free from close approaches to Jupiter; most short-period comets have close approaches to Jupiter every so many decades, but P/Neujmin 1 has not gone close to Jupiter in over 1200 years. (Incidentally, P/Hartley-IRAS 1983v also must have a somewhat stable orbit with respect to Jupiter, although it has a very high inclination -- P/Neujmin 1 and P/Arend-Rigaux have much smaller orbital inclinations.)

A. C. Gilmore and P. M. Kilmartin recovered P/Neujmin 1 as a stellar object on photographs taken Feb. 26 at Mt. John University Observatory on the southern of New Zealand's two large islands. They estimated the comet's magnitude as 18. Brian Marsden encouraged observations while comet 1984c is still some distance from its Oct. 8 perihelion later this year: "Southern-hemisphere photoelectric observers are urged to attempt to determine the rotation period of this object now, before there is the potential for contamination from coma" (IAUC 3920). Comet 1984c has an orbital

period around 18 years, and this is its fifth observed apparition (it was initially discovered in 1913).

P/Giacobini-Zinner was recovered by a team of observers with the 4-m Mayall and the (No. 1) 91-cm reflectors at Kitt Peak on March 29 and April 3, and CCD images taken on Jan. 28 by Richard West and H. Pedersen at the European Southern Observatory were subsequently found. The Kitt Peak group, headed by Mike Belton, also employed CCDs, and they estimated a red magnitude (R) of 22.9 on April 3. The ESO observers estimated their images to have been of magnitude 24.5 or fainter, their exposures being made with the 1.5-m Danish reflector. (See recovery photo on the cover.)

P/Giacobini-Zinner (1984e) is noteworthy in that the former ISEE-3 satellite, now known as ICE (International Cometary Explorer), is being sent toward the comet for a view in 1985 September. This comet will be well-placed for observation from the Northern Hemisphere around the time of its perihelion (1985 Sept. 5), and may be as bright as total visual magnitude 8. The ICQ will have an ephemeris for this object in a future issue.

The Minor Planet Circulars/Minor Planets and Comets (MPCs) contain astrometric observations made during the past 5 months of the following comets: P/Smirnova-Chernykh (basically observable throughout its orbit, so that it does not receive a preliminary letter designation), Bowell (1982 I), P/Halley (1982i), P/IRAS (1983j), IRAS (1983k), Černis (19831), P/Crommelin (1983n), IRAS (1983o), P/Wild 2 (1983s), P/Taylor (1983u), P/Harrington-Abell (1983r), P/Hartley-IRAS (1983v), P/Clark (1983w), Bradfield (1984a), P/Neujmin 1 (1984c), P/Russell 4 (1984d), P/Encke (also observable throughout its orbit, but only 2 observations of this important comet have been reported since before the time of its 1980 perihelion!), P/Arend (1983q), P/Tempel 2 (1982d), P/Kopff (1982k), and Shoemaker (1983p). [The MPCs are available by subscription from the Minor Planet Center, Smithsonian Astrophysical Observatory, 60 Garden Street, Cambridge, MA 02138, U.S.A.]

Ken Russell, UKSTU, observed comet 1983b (P/Pons-Winnecke) at total photographic magnitude near 19 on Oct. 6. A. Mrkos photographed P/Russell 3 (1983i) on last July 17.99, 31.89, and Aug. 9.88 at total magnitude 16.0, 16.3, and 16.5, respectively. Mrkos also estimated the following total magnitudes from photos exposed of P/IRAS (1983j) on Aug. 14.04, Sept. 4.01, and Oct. 27.83: 12.8, 10.5, and 13.0. Lowell Observatory plates taken of P/du Toit-Neujmin-Delporte 1983g last Sept. 4.35 and 14.35 found the object at total mag 16.0 and 16.5, respectively. Gilmore and Kilmartin at Mount John Observatory photographed comet IRAS-Araki-Alcock 1983d last Oct. 4.60, finding a nuclear magnitude of 18.6. These same observers also noted P/Johnson 1983h at nuclear mag 17.1 on an Oct. 4.37 photo.

Edgar Everhart (Chamberlin Observatory field station, Univ. of Denver) observed a 10" tail in p.a. 290 degrees on a photo of P/Harrington-Abell (1983r) taken 1984 Jan. 8.39. P/Clark (1983w) was near nuclear mag 19.5 and appeared diffuse with central condensation and tail structure around p.a. 270-290 degrees on a plate taken by Jim Gibson on Dec. 15.52 at Palomar. Observers at the Smithsonian's Oak Ridge Observatory in Harvard, MA, photographed P/Smirnova-Chernykh on Jan. 9.41; the plate reveals the comet with a nuclear condensation near mag 17.0 and with a trace of tail in p.a. 300 degrees. This comet was at perihelion on Feb. 21. P/Taylor was observed in early January by several individuals, all noting the comet to be around total photographic mag 15.5-16.

Martha S. Hanner of Caltech's Jet Propulsion Laboratory reports in a recent Astrophysical Journal Letter that she has detected an absorption feature at 2.9-3.0 microns (2900-3000 nm) in comet Černis 19831, and she interprets this feature as being scattering from water ice grains in the comet's coma. Water ice has yet to be unambiguously identified in a comet, although all of the evidence points toward water ice being an important constituent in cometary nuclei. Hanner's observations were made last August with the NASA's infrared telescope at Mauna Kea, Hawaii. With a photometric diaphragm aperture of only 7 arcsec, the comet's magnitude increased from 12.4 at 1.25 microns to 1.71 at 20 microns.

Incidentally, Černis discovered his

comet visually with a 19-inch-aperture f/4.8 reflector at 65x, and he also uses 20x110 binoculars for hunting. Between his discovery of comet Černis-Petrauskas 1980 IV and his finding comet 19831, Černis had only hunted for 31 hours with the telescope, according to John Bortle in Sky and Telescope (1984, 67, 386); he did, however, spend nearly 300 hours hunting with the binoculars during that same time interval. A newspaper journalist recently asked this author to compile some rough statistics on the number of comets which are currently discovered by amateur astronomers, and the question arose concerning what really specifies an observer as an amateur. For example, Černis is apparently an astronomy student at the Vilnius Observatory in the U.S.S.R., so he probably could not be classified as an amateur. At any rate, amateurs are now discovering only about one-third of the new comets, as compared with their discovering around half of all new comets a decade ago.

William Bradfield's discovery of comet 1984a was made with a 10-inch reflector, an instrument which he has apparently been using during the past 2-3 years. The comet was followed visually by Andrew R. Pearce and M. Clark of Australia until Jan. 28; Pearce could not find comet 1984a on 4 nights during the 10-day period beginning Jan. 29, when he used a 15.2-cm reflector at 72x. Pearce also noted a short (5') tail on Jan. 15 which gradually shortened during the following 2 weeks. Comet Bradfield 1984a is significant in that it may be actually a short-period comet (that is, one with an orbital period under 200 years); if so, it would be Bradfield's first periodic comet out of twelve. Although a much longer observational arc is needed to be sure, astrometric observations spanning more than 2 months, from January through March, indicate that comet 1984a may have a period between 160 and 190 years.

Incidentally, for amateur observers worried about satellites such as the Infrared Astronomical Satellite (IRAS) seriously reducing the number of visual discoveries of comets, the following should be noted: Of the six comets discovered by IRAS last year, 4 comets were discovered by amateur and/or professional observers who were temporarily not aware that the comets were already known objects. For example, comet IRAS 1983k was unexpectedly bright, around total photographic magnitude 16, when it was accidentally rediscovered by Ken Russell (UKSTU) on 1984 March 6. In addition, P/IRAS 1983j was bright enough that it would most likely have been found, even though it has not been reported by any observers (outside of IRAS) as a discovery. The only comet among IRAS' six that would probably not have been found without IRAS was comet 1983f.

Periodic comets Crommelin (1983n) and Hartley-IRAS (1983v) have both been much brighter than expected during the month of March. P/Crommelin was still near total visual magnitude 9 during the final week of March. Comet 1983v experienced an outburst of over 2 magnitudes in brightness in February, as it reached magnitude 7.4 on the 24th of that month. It was still around 9th magnitude during late March. An extended ephemeris for comet 1983v is provided on page 52.

Ken Russell (UKSTU) also reported unusually bright images of comet Bowell (1982 I) on plates taken last October; the comet was at least magnitude 14, and it had a tail around 15' long which exhibited some find structure. A. Mrkos of Kleť Observatory in Czechoslovakia reported a photographic total magnitude for comet Bowell of 16.4 on Aug. 13.96 of last year, while observers at Lowell Observatory reported total magnitudes of 15.0, 15.5, 16.8, and 16.8 on photographs exposed on 1983 July 17.36, Aug. 13.33, Oct. 4.10, and Oct. 11.13, respectively.

P/Encke was followed visually by several observers until several days before perihelion (March 27). Charles S. Morris and Alan Hale, observing north of Los Angeles, CA, observed P/Encke as a small, 7th-magnitude object on Feb. 23. P/Wild 2 (1983s) has been fainter than expected, visually, at this apparition. Several observers have indicated that they probably observed P/Wild 2 in March -- but the object has been fainter than magnitude 13 and extremely difficult to see in moderate-sized amateur instruments. This author believes that he observed comet 1983s on March 3.13 at total visual magnitude 13.1, using a 20.3-cm f/6 reflector at 68x, and again on March 4.04 at magnitude 13.4; the comet was then traversing a crowded stellar

region in Taurus, and even the Vehrenberg photographic star atlas could not unambiguously help locate P/Wild 2 -- the Palomar Sky Survey had to be used, as well. Also on March 4, P. Wehinger and colleagues using the 4-m Kitt Peak reflector observed a well-developed dust coma, with tail structure oriented at p.a. 96 degrees; their photometry gave V = 14.4 (total) and 17.7 (nuclear).

P/Halley has been stirring quite a bit of activity during the past year, as the number of meetings devoted to comets worldwide has been steadily increasing (noted especially by reviews of two of these meetings in this issue). No less than 3 professional meetings dealing with comets will be held this June in Europe, including IAU Colloquium No. 83, "Dynamics of Comets: Their Origin and Evolution", in Rome. Many businesses are jumping on the bandwagon, as attested by the escalating number of P/Halley-affiliated advertising in various magazines; the ICQ, for example, has already received 2 advertisements for western-hemisphere cruises southward in early 1986 to view the comet!

P/Halley itself (1982i) has been followed by astronomers using large instruments during the past year, as it has brightened to nuclear magnitude 23-24. Observers continue to remark about the apparent variability of the comet's brightness, noting possible variations of over 1 full magnitude on timescales of hours to days. (See for example IAUC 3928, 3934.)

-- 1984 April 22

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Ephemeris for Periodic Comet Hartley-IRAS (1983v), from Orbital Elements by Brian G. Marsden (MPC 8672):

Equinox 1950.0 T = 1984 Jan. 8.70657 ET
Arg. of Peri. = 47°.11115
Node = 0.80001 e = 0.8339688
Incl. = 95.72507 q = 1.2824901 AU

| Date | ET | R. A. (1950) | Decl. | Delta | r | Elong. | Mag. |
|---|---|---|---|---|---|---|---|
| 1984 | 04 30 | 14 34.64 | +77 49.4 | 1.718 | 1.954 | 87.6 | 11.1 |
| 1984 | 05 05 | 13 27.52 | +75 08.8 | | | | |
| 1984 | 05 10 | 12 46.23 | +71 40.5 | 1.820 | 2.046 | 87.7 | 11.4 |
| 1984 | 05 15 | 12 21.09 | +67 55.9 | | | | |
| 1984 | 05 20 | 12 05.41 | +64 10.0 | 1.957 | 2.138 | 85.9 | 11.8 |
| 1984 | 05 25 | 11 55.49 | +60 30.2 | | | | |
| 1984 | 05 30 | 11 49.24 | +57 00.3 | 2.125 | 2.231 | 82.5 | 12.1 |
| 1984 | 06 04 | 11 45.46 | +53 41.7 | | | | |
| 1984 | 06 09 | 11 43.40 | +50 35.1 | 2.314 | 2.325 | 78.0 | 12.5 |
| 1984 | 06 14 | 11 42.58 | +47 40.4 | | | | |
| 1984 | 06 19 | 11 42.67 | +44 57.1 | 2.518 | 2.418 | 72.7 | 12.8 |
| 1984 | 06 24 | 11 43.47 | +42 24.5 | | | | |
| 1984 | 06 29 | 11 44.82 | +40 01.9 | 2.731 | 2.512 | 66.9 | 13.2 |
| 1984 | 07 04 | 11 46.60 | +37 48.4 | | | | |
| 1984 | 07 09 | 11 48.73 | +35 43.3 | 2.945 | 2.605 | 60.8 | 13.5 |
| 1984 | 07 14 | 11 51.14 | +33 46.0 | | | | |
| 1984 | 07 19 | 11 53.76 | +31 55.8 | 3.157 | 2.698 | 54.5 | 13.8 |
| 1984 | 07 24 | 11 56.58 | +30 11.9 | | | | |
| 1984 | 07 29 | 11 59.54 | +28 34.0 | 3.362 | 2.790 | 48.2 | 14.1 |
| 1984 | 08 03 | 12 02.64 | +27 01.4 | | | | |
| 1984 | 08 08 | 12 05.83 | +25 33.8 | 3.557 | 2.881 | 41.8 | 14.4 |
| 1984 | 08 13 | 12 09.09 | +24 10.7 | | | | |
| 1984 | 08 18 | 12 12.42 | +22 51.9 | 3.738 | 2.972 | 35.5 | 14.6 |
| 1984 | 08 23 | 12 15.80 | +21 36.9 | | | | |
| 1984 | 08 28 | 12 19.21 | +20 25.5 | 3.902 | 3.062 | 29.4 | 14.8 |