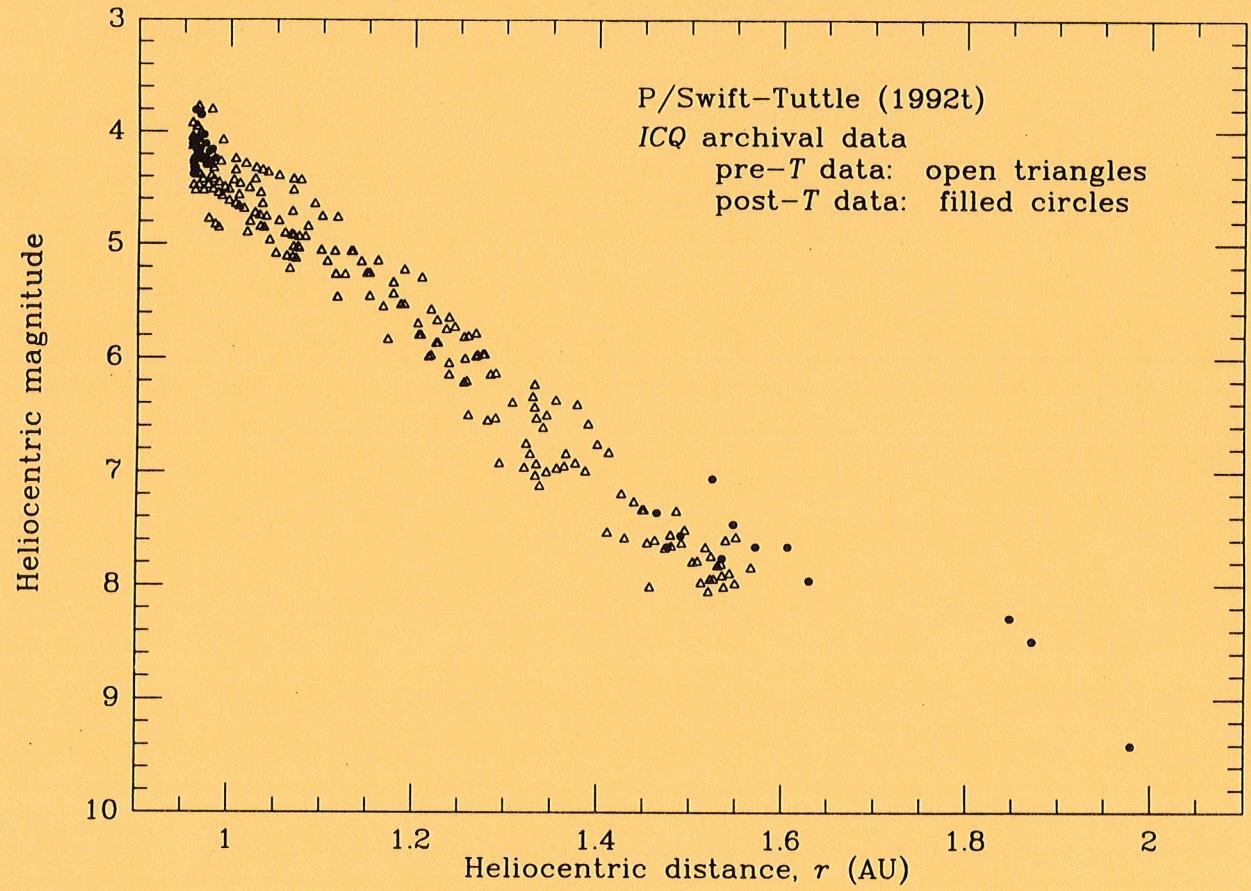
INTERNATIONAL COMET QUARTERLY

Whole Number 89 **JANUARY 1994** **Vol. 16, No. 1**



Light curve of periodic comet Swift-Tuttle, from visual observations submitted to the *ICQ*. Revision to the graph on page 182 of the last issue.

SMITHSONIAN ASTROPHYSICAL OBSERVATORY
60 Garden Street · Cambridge, MA 02138 · U.S.A.

The International Comet Quarterly (*ICQ*) is a journal devoted to news and observation of comets, published by the Smithsonian Astrophysical Observatory in Cambridge, Massachusetts. Regular issues are published 4 times per year (January, April, July, and October), with an annual *Comet Handbook* of ephemerides published normally in the first half of the year as a special fifth issue. An index to each volume normally is published in every other January issue (even-numbered years); the *ICQ* is also indexed in *Astronomy and Astrophysics Abstracts* and in *Science Abstracts Section A*.

The regular (invoiced) subscription rate is US$31.00 per year for surface-mail delivery (price includes the annual *Comet Handbook*; the price without the *Handbook* is US$23.00 per year). Subscribers who do not wish to be billed may subscribe at the special rate of US$23.00 per year for surface-mail delivery (rate is $15.00 without *Handbook*). Add $15.00/year to each of these rates for airmail delivery outside of the United States. [The last set of digits (after the hyphen) on the top line of the mailing address label gives the Whole Number that signifies the last *ICQ* issue which will be sent under the current subscription status.] Make checks or money orders payable in U.S. funds (and drawn on a U.S. bank) to *International Comet Quarterly* and send to Daniel Green; Smithsonian Astrophysical Observatory; 60 Garden St.; Cambridge, MA 02138, U.S.A. [Group subscription rates available upon request.] Back issues are $4.00 each — *except* for "current" *Comet Handbooks*, which are available for $15.00 ($8.00 to subscribers if ordered with their *ICQ* subscription; see above). Up-to-date information concerning comet discoveries, orbital elements, and ephemerides can be obtained by subscribing to the *IAU Circulars* and/or the *Minor Planet Circulars* (via postal mail and also available via computer access); for further information, contact the *ICQ* Editor at the above address.

Cometary observations also should be sent to the Editor in Cambridge; all data intended for publication in the *ICQ* that is not sent via computer electronic mail should be sent on standard *ICQ* observation report forms, which can be obtained upon request from the Editor. Those who can send observational data (or manuscripts) in machine-readable form are encouraged to do so [especially through e-mail via the computer networks *SPAN* (CFAPS2::GREEN), *BITNET* (GREEN@CFA), or Internet (GREEN@CFA.HARVARD.EDU), or via floppy disks that can be read on an IBM PC], and should contact the Editor for further information.

Among the Observation Coordinators (OCs) listed below, those with postal addresses have e-mail contacts with the *ICQ* Editor (or regularly send data to the Editor on IBM PC-compatible floppy disks); observers in the general area of such OCs who lack access to e-mail networks may send data to the OC for relay to the *ICQ* in electronic form.

ICQ EDITORIAL STAFF::

Daniel W. E. Green.....Editor Charles S. Morris.....Associate Editor
Syuichi Nakano.....*Comet Handbook* Editor

OBSERVATION COORDINATORS::

AUSTRALIA.....David A. J. Seargent
BRAZIL.....José Guilherme de S. Aguiar (R. Candido Portinari, 241; 13089-070 - Campinas - S.P.)
CZECH REPUBLIC.....Petr Pravec (Astronomical Institute; CS-25165 Ondrejov)
GERMANY.....Jost Jahn (Neustaedter Str. 11; D-29389 Bodenteich)
HUNGARY.....Krisztián Sárneczky, Kadar u. 9-11., H-1132 Budapest
JAPAN.....Akimasa Nakamura (P.O. Box 9, Kuma Post Office; Kuma-cho, Ehime 791-12)
Syuichi Nakano (P.O. Box 32; Sumoto Post Office; Hyogo-Ken, 656-91)
THE NETHERLANDS.....A. H. Scholten (Horsterdijk 6a; NL-6961 KP Eerbeek)
NEW ZEALAND.....Alan C. Gilmore and Pamela Kilmartin (P.O. Box 57; Lake Tekapo 8770)
NORWAY.....Bjoern H. Granslo (Postboks 1029; Blindern; N-0315 Oslo 3)
POLAND.....Jerzy Rafalski and Krzysztof Jaroszewski (Institute of Astronomy; Nicolaus Copernicus University; ul. Chopina 12/18; 87-100 Torun)
PORTUGAL.....Alfredo Pereira (R. Antero de Quental 8, 2 dto; Carnaxide; 2795 Linda-a-Velha)
SLOVENIA.....Herman Mikuž (Kersnikova 11; 61000 Ljubljana)
SWEDEN.....Joergen Danielsson (Hasselstigen 2D; 386 00 Farjestaden)
UNITED KINGDOM.....Jonathan Shanklin (11 City Road; Cambridge CB1 1DP, England)
Guy M. Hurst (16 Westminster Close; Kempshott Rise; Basingstoke, Hants RG22 4PP, England)

EDITORIAL ADVISORY BOARD::

Michael F. A'Hearn, *University of Maryland*
Brian G. Marsden, *Harvard-Smithsonian Center for Astrophysics*
David D. Meisel, *State University College of New York, Geneseo*
Zdenek Sekanina, *Jet Propulsion Laboratory*

++++++++++++

This issue is No. 89 of the publication originally called *The Comet* (founded March 1973) and is Vol. 16, No. 1, of the *ICQ*. *[ISSN 0736-6922]*

****

— SUBSCRIPTION RATE INCREASE —

As noted in the last issue, we were forced to increase our subscription prices after a long period of years with no change. We note that U.S. distribution will be via third-class mail; first-class delivery is available within the U.S. for the same additional annual surcharge as for overseas airmail: $15.00 per year. Back issues will remain at $4.00 per issue if sent by surface mail until September 30, 1994; beginning Oct. 1, 1994, all back issues will cost $6.00 per issue if sent by surface mail.

◇ ◇ ◇

— CORRIGENDA —

• On page 182 of the October 1993 issue, there were several typographical errors. Most importantly, the symbols in the graph on that page were interchanged (*i.e.*, the pre-perihelion data were represented by open triangles, and the post-perihelion data by filled circles. In the text, second paragraph, third line, *for* "pre-discovery" *read* "pre-recovery". Three lines later, *for* "Twelve post-conjunction observers" *read* "Twelve post-conjunction observations". In the final paragraph, fourth line, *for* "Data were chosen such only" *read* "Data were chosen such that only". (The cover graph, on page 139 of the same issue, was also produced from the same data set used for the graph on page 182.) A revised graph is published on the front cover of this issue.

• In the April 1993 issue, page 78, *for* Periodic Comet Faye (1992n) *read* Periodic Comet Schuster (1992n). Also, the last observation under this same section (that by NAK01 dated 1992 Dec. 25.65) is to be deleted.

• In the 'Descriptive Information' under "Tabulation of Comet Observations" in the last four issues of the *ICQ*, the heading "Periodic Comet Väisälä (1992u)" *should read* "Periodic Comet Väisälä 1 (1992u)" [*ICQ* **15**:9, 67, 106, 144].

ROMAN NUMERAL DESIGNATIONS OF COMETS IN 1992

The following tabulation is from *Minor Planet Circular* 22847.

Comet	T	Name	Letter	Reference
1992 I	Jan. 20.0	Helin-Lawrence	1991l	*MPC* 19654
1992 II	Jan. 25.4	P/Chernykh	1991o	*MPC* 18598
1992 III	Feb. 1.0	Zanotta-Brewington	$1991g_1$	*MPC* 20774
1992 IV	Feb. 16.4	P/Mueller 4	1992g	*MPC* 20775
1992 V	Feb. 19.7	Helin-Alu	1991r	*MPC* 19468
1992 VI	Mar. 13.1	P/Kowal 1	1991i	*MPC* 20775
1992 VII	Mar. 19.5	Bradfield	1992b	*MPC* 19818
1992 VIII	Mar. 21.2	Mueller	$1991h_1$	*MPC* 19818
1992 IX	Apr. 13.2	P/Giacobini-Zinner	1991m	*IAUC* 5225
1992 X	Apr. 22.7	Tanaka-Machholz	1992d	*MPC* 21758
1992 XI	May 3.4	McNaught-Russell	1991v	*MPC* 22196
1992 XII	May 20.1	P/Tsuchinshan 2	$1991e_1$	*IAUC* 5403
1992 XIII	May 25.8	Bradfield	1992i	*MPC* 20481
1992 XIV	June 7.8	P/Brewington	1992p	*MPC* 22571
1992 XV	June 13.3	P/Shoemaker-Levy 8	1992f	*MPC* 20775
1992 XVI	July 8.7	Helin-Alu	1992a	*MPC* 22196
1992 XVII	July 11.0	Machholz	1992k	*MPC* 20602
1992 XVIII	July 22.1	P/Grigg-Skjellerup		*MPC* 14593
1992 XIX	July 24.5	Shoemaker-Levy	$1991a_1$	*MPC* 20602
1992 XX	Aug. 3.6	Mueller	1993d	*MPC* 22382
1992 XXI	Aug. 5.9	P/Smirnova-Chernykh		*MPC* 14593
1992 XXII	Aug. 28.1	P/Wolf	1992m	*IAUC* 5567
1992 XXIII	Sept. 1.7	P/Daniel	1992o	*IAUC* 5581
1992 XXIV	Sept. 6.4	P/Schuster	1992n	*MPC* 20602
1992 XXV	Sept. 13.1	P/Giclas	1992l	*IAUC* 5561
1992 XXVI	Oct. 27.2	P/Singer Brewster	1992e	*IAUC* 5490
1992 XXVII	Nov. 1.6	Ohshita	$1992a_1$	*MPC* 21533
1992 XXVIII	Dec. 12.3	P/Swift-Tuttle	1992t	*MPC* 21235

Φ Φ Φ

TABULATION OF COMET OBSERVATIONS

Descriptive Information (to complement the Tabulated Data):

Due to time constraints, descriptive information sent on paper for comets Mueller 1993a and 1993p will appear in the April issue.

◇ *Comet Shoemaker-Levy* $1991a_1$ = *1992 XIX* ⟹ 1992 July 23.75: in 60-cm f/12.5 C (125×), coma 5′, DC = 4, 0′.12 tail in p.a. 85° [KRY01].

◇ *Comet Mueller 1993a* ⟹ 1993 May 10.18: comet slightly brighter than during previous observations; the brighter central region is slightly off-center toward the W w/in a slightly fan-shaped coma [HAL]. Aug. 21.45: small, condensed coma; central brighter region slightly off-center to N [HAL]. Sept. 20.02: small extinction correction (< 0.1 mag) applied; m_1 = 10.7 when HS comparison stars are used; tail 0°.14 in p.a. 304°; anomalous tail >0°.22 long in p.a. 178°; measured on composite image of 6 min total integration time [PRA01]. Sept. 23.00: interference from two stars of mag 10 [MEY]. Sept. 23.10: fanlike tail p.a. 280°-350° [SZE02]. Sept. 25.00: clearly brighter than two days before [MEY]. Oct. 7.82: ill-defined coma [MEY]. Oct. 9.87: fanlike tail p.a. 290°-325° [VIC]. Oct. 16.80: fanlike tail p.a. 265°-310° [SZE02]. Oct. 16.80: fanlike tail p.a. 270°-330° [SAR02]. Oct. 17.79: comet involved w/ star of mag 11 [MEY]. Oct. 18.83: comet near star of mag 12 [SCH04]. Oct. 19.06: well-condensed coma; V = 9.9 when HS is used as source of comparison stars; unfiltered CCD total magnitude (C) = 10.7 (*i.e.*, V–C = −0.5 mag); tail system spans p.a. 279°-360°/0°-2° (length 6′.1 at 279° and 301°, 6′.0 at 320°, 8′.1 at 338°, and > 11′.4 at 2°); 'anti'-tail from Aug. and Sept. projects on the tailward side now again, its faintest part extending to 13′ at p.a. 280°; measured on composite unfiltered image of 4 min total integration time [PRA01]. Oct. 25.96: fanlike tail p.a. 100°-125° [SAR02]. Oct. 26.02: fanlike tail p.a. 110°-130° [SZE02]. Nov. 2.72: comet located w/in an asterism [MEY]. Nov. 16.96: photometry obtained w/ 20-cm f/2 Baker-Schmidt camera + V filter + ST-6 CCD; comet has 1′ central cond.; ~ 7′ circular coma, whose center is shifted 3′.5 off the comet nucleus in p.a. 15°; no trace of tail is present [MIK]. Nov. 29.25: observation made during total lunar eclipse; low altitude [HAL]. Dec. 8.76: fanlike tail p.a. 65°-75° [SZE02]. 1994 Jan. 5.75 and 12.73: 0°.03 fanlike tail from p.a. 30° to 50° [SAR02]. Jan. 10.13: vague, tail-like structure seen toward the NE [HAL]. Jan. 15.12: some interference from cirrus [HAL].

◇ *Comet Shoemaker-Levy 1993h* ⟹ 1993 June 10.19: low altitude [HAL].

◇ *Comet Mueller 1993p* ⟹ 1993 Sept. 20.80: small extinction correction (< 0.1 mag) applied; m_1 = 12.9 when HS used for comparison stars; wide curved tail, its 'axis' (brightest curve) going from the coma's cond. as follows: 0.′6 at p.a. 286°, 1.′1 at p.a. 304°, and 2.′2 at p.a. 308°; measured on composite image, 20 min total integration time [PRA01]. Oct. 7.80: coma dia. 1.′0; mag measured in aperture of dia. 0.′5, to exclude image of a close brighter star [PRA01]. Oct. 19.10: m_1 = 12.2 when HS is used as source of comparison stars; tail spans p.a. 14°-128° (length 0.′9 at 128°, 1.′1 at 85°, 1.′3 at 56°, 2.′0 at 33°, 3.′6 at 14°); measured on composite unfiltered image of 4 min total integration time [PRA01]. Oct. 25.41: small, "dense" coma [HAL]. Nov. 3.76: comet near threshold of visibility [MEY]. Nov. 6.21: small, "dense" asymmetric coma; the leading edge is much more sharply defined than the trailing edge [HAL]. Nov. 16.85 and Dec. 3.79: photometry obtained with 20-cm *f*/2 Baker-Schmidt camera + *V* filter + ST-6 CCD; stellar central cond. w/o coma; broad, prominent tail [MIK]. Nov. 18.88: curved tail, w/ the radial coordinates of its axis (*i.e.*, distance from nuclear cond. at given p.a.) as follows: 30″ at p.a. 51°, 60″ at 46°, 120″ at 40°, 240″ at 33°, 336″ at 29° [PRA01]. Dec. 4.12: some interference from nearby 8th-mag star [HAL]. Dec. 10.16: brightness estimate difficult due to 10th-mag star near coma and 8th-mag star in field [HAL]. Dec. 15.12: trailing edge of coma very ill-defined, with apparent beginning of a short tail; observation hurried due to approaching cirrus clouds [HAL]. 1994 Jan. 4.10: significant brightening since last observation [HAL]. Jan. 5.71: fanlike tail from p.a. 0° to 15° and a brighter bend at p.a. 15° [SZE02]. Jan. 5.71: fanlike tail from p.a. 10° to 30° [SAR02]. Jan. 19.71: fan-shaped coma in p.a. 80° [SZE02]. Jan. 19.71: elliptical coma 30″ × 40″; major axis of the coma in p.a. 80°/260° [SAR02].

◇ *Periodic Comet Ashbrook-Jackson (1992j)* ⟹ 1993 June 23.24: very slightly diffuse [SCO01]. July 17.33: comet at limit of visibility; observation difficult [MOD]. July 21.45: "a suspected observation of the comet was obtained, under low altitude and against a skyglow background, on June 29.44 UT; however, moonlight and poor weather prevented confirmation until this observation; the conditions at this observation were only fair, with interference from damp air and occasional clouds" [HAL]. Aug. 22.36: stellar cond. of mag ~ 14.5 [MOD]. Aug. 26.34: stellar cond. of mag 14.7 ± 0.2, offset toward p.a. 57° ± 9° [MOD]. Sept. 24.30: at 164×, coma elongated ~ 0.′5 in p.a. 260° ± 10°; almost stellar cond. of mag 14.9 ± 0.1 [MOD]. Oct. 11.24: at 164×, stellar cond. of mag 14.5 ± 0.1 [MOD]. Oct. 14.27: at 164×, stellar cond. of mag ~ 14; coma elongated toward W [MOD]. Oct. 19.08: small well-condensed coma; m_1 = 12.2 when HS is used as source of comparison stars [PRA01]. Oct. 24.29: at 164×, coma elongated toward p.a. 285° ± 10° [MOD].

◇ *P/Encke* ⟹ 1993 Nov. 16.84: photometry obtained with 20-cm *f*/2 Baker-Schmidt camera + *V* filter + ST-6 CCD; small starlike nucleus; delicate circular coma [MIK]. Nov. 18.81: fan-like inner coma (spans p.a. 212°-305° out to a distance of 48″ from nuclear cond.); faint halo w/ dia. 4.′0; "total" mag measured in aperture of dia. 27″ due to the presence of nearby stars; measured on composite image of 8 min total integration time [PRA01]. Dec. 3.82: observed as on Nov. 16.84; circular coma with only slight cond. [MIK]. Dec. 4.15: "for both attempts, a diffuse, low-surface-brightness coma was assumed" [HAL]. Dec. 12.97: "exceedingly difficult object, but presence confirmed using Lumicon comet filter, which enhances comet's visibility" [BOR]. Dec. 16.97: Lumicon comet filter at 68× shows coma definitely 3′ in diameter, occasionally suspected out to a total dia. of 4.′5 [BOR]. Dec. 17.99: in 31.7-cm *f*/6 L (68×), "comet visible directly only when Lumicon comet filter is used; then comet is clearly seen and shows slight cond. toward the center"; 3.′5 coma, DC = 1 [BOR]. Dec. 30.97: "comet plainly seen; area of greatest cond. suggested to be offset anti-sunward of coma's center" [BOR]. Dec. 31.97: "coma rather more circular in outline tonight, denser and more condensed; no nucleus or separate cond. at 88× or 110×; Lumicon comet filter strongly enhances comet, but size is unchanged from direct view" [BOR]. 1994 Jan. 5.73: fanlike tail from p.a. 260° to 320° [SZE02]. Jan. 5.73: elliptical coma 1.′5 × 2′; major axis of coma in p.a. 120°-300° [SAR02]. Jan. 10.12: faint, wide tail-like structure visible to N and E [HAL]. Jan. 12.083: unfiltered CCD images obtained with a 25-cm telescope show a broad, 46″ fan-like sunward tail centered at p.a. 281° [Paul Roques, Williams, AZ]. Jan. 12.72: fanlike tail from p.a. 240° to 280° [SAR02]. Jan. 12.72 and 15.76: fanlike trail from p.a. 220° to 280° [SZE02]. Jan. 19.72: 1′ fanlike tail from p.a. 250° to 300° [SZE02]. Jan. 19.72: 1′ fanlike tail from p.a. 270° to 290° [SAR02]. Jan. 20.10: "strong moonlight, but comet very bright in Swan-band filter; hint of whorls(?) in coma" [SPR]. Jan. 24.09: "very strong moonlight, but comet brighter in Swan-band filter; also, quite bright in yellow (#8) filter" [SPR]. Jan. 27.07: bright moonlight (full moon) and low altitude; the coma exhibited a distinct sunward fan, but little else was visible in the bright sky [HAL].

◇ *Periodic Comet Forbes (1993f)* ⟹ 1993 June 19.44: "attempt somewhat hampered by nearby 4th-mag star (ϵ Psc), with additional interference due to beginning of twilight" [HAL].

◇ *Periodic Comet Hartley 3 (1993m)* ⟹ 1993 Dec. 17.80: photometry obtained with 20-cm *f*/2 Baker-Schmidt camera + *V* filter + ST-6 CCD; comet has faint tail [MIK].

◇ *Periodic Comet Howell (1992c)* ⟹ 1993 July 22.75: weak central condensation [NAK01]. July 25.44: observation attempted in response to report of possible outburst [HAL]. Oct. 19.12: m_1 = 16.4 when HS is used as source of comparison stars [PRA01]. 1994 Jan. 7.14: main tail extends beyond 1.′6 in p.a. 238°; broad fan-shaped structure extends between p.a. 61° and p.a. 252° [SCO01].

◇ *Periodic Comet Kushida (1994a)* ⟹ 1994 Jan. 15.94: dense, circular coma [MIK]. Jan. 19.99: major axis of coma in p.a. 120°/300° [KIS02]. Jan. 23.16: large, circular coma; no trace of tail [MIK].

◇ *Periodic Comet Schäumasse (1992x)* ⟹ 1993 May 8.16: coma large and diffuse; the surface brightness is quite low [HAL]. May 17.22: very vague, diffuse coma, with very low surface brightness [HAL]. June 12.22: the comet was assumed to be a large, low-surface-brightness coma [HAL]. June 23.192: asymmetric coma 2.′0 × 3.′7, with long axis along p.a. 107°-287° [SCO01].

◇ *P/Schwassmann-Wachmann 1* ⟹ 1993 Feb. 15.93: three 5-sec exp. on T-Max 400 film w/ image intensifier, 40-cm L, yield $m_1 = 12.7$; 30″ coma w/ a strong cond. [J.-C. Merlin, Le Creusot, France]. May 10.16: altitude pretty low [HAL]. Aug. 21.46: some interference from zodiacal light; also there were two ~ 10th-mag stars near the comet's expected position [HAL]. Oct. 19.14: $m_1 = 15.0$ when HS is used as source of comparison stars; faint halo of dia. 1′.7; measured on unfiltered image of 2 min integration time [PRA01]. Oct. 25.49: "this negative observation occurred just over two days prior to the outburst reported by Nakamura (*IAUC* 5886) and < 2 days after a photographic estimate of 15.5 reported by Kojima (*ibid.*); thus, the time of the outburst appears to be relatively well defined" [HAL]. Oct. 27.81: comet is in outburst, which must be very recent; image shows a very strong central cond. and faint coma, extended northward [NAK01]. Nov. 20.10: circular outer coma of dia. 128″; broad fan-like inner coma (spans p.a. 294°-360°/0°-77°; brightest part at distance from nuclear cond. of 7″ at p.a. 350°, 14″ at 12°, 45″ at 45°); measured on composite image of 14 min total integration time [PRA01]. Dec. 6.02: circular outer coma of dia. 5′.3; total mag measured in aperture of dia. 1′.2; broad fan-like inner coma (spans p.a. 281°-360°/0°-78°; bright part (jet) extends to distance from nuclear cond. of 18″ at p.a. 354°); measured on composite image of 6 min total integration time [PRA01]. Dec. 8.63, 11.77, and 25.81: central 7×7 pixels (10″ × 10″) were measured as m_2 [NAK01]. Dec. 15.25: comet's expected position close to two ~ 10th-mag stars [HAL]. Dec. 24.51: w/ 25-cm $f/6$ reflector + CCD, $m_1 = 15.7$ comet diffuse [T. Kojima, YGCO Chiyoda Observatory, Japan]. Dec. 29.56: observed as on Dec. 24.51; $m_1 = 15.9$, comet diffuse [Kojima]. 1994 Jan. 2.61: observed as on Dec. 24.51; $m_1 = 13.2$; comet almost stellar – in outburst [Kojima]. Jan. 4.58: very strong central cond. suggests that this outburst is very new [NAK01]. Jan. 9.14: poor sky, with some interference from cirrus; the comet is diffuse with some, but not much, central brightening [HAL]. Jan. 17.18: inner coma structure has dia. 93″; broad fan-shaped emission region extends through ~ 90° of p.a., from p.a. 298° to 28°, with a ring-tailed structure curling towards lower p.a. and wrapping through to p.a. 123°; a faint outer coma has dia. at least 15′.9 [SCO01]. Jan. 23.19: photometry obtained with 20-cm $f/2$ Baker-Schmidt camera + V filter + ST-6 CCD; stellar cond. w/o coma [MIK].

◇ *P/Schwassmann-Wachmann 2* ⟹ 1993 Sept. 20.14: small extinction correction (< 0.1 mag) applied; $m_1 = 15.5$ when HS comparison stars used; measured in aperture of 0′.3 [PRA01]. Nov. 20.14: "well-developed tail with a narrow structure at tail axis (neck-line structure?)" [PRA01]. Nov. 29: during total lunar eclipse [KRO02]. Dec. 12.04: major axis of the coma p.a. 80°-260° [SAR02]. Dec. 12.04 and 19.04: major axis of the coma p.a. 90°-270° [BAK01]. Dec. 12.15 and 1994 Jan. 23.17: photometry obtained with 20-cm $f/2$ Baker-Schmidt camera + V filter + ST-6 CCD; comet has straight tail [MIK]. Dec. 17.94: fan-like tail [MIK]. 1994 Jan. 9.19: poor sky, with some interference from cirrus; the comet appears similar to a small globular cluster [HAL]. Jan. 15.81: 1′ fanlike tail from p.a. 260° to 290° [SAR02]. Jan. 19.82: elliptical coma 30″ × 40″; major axis of coma in p.a. 100°/280° [SAR02]. Jan. 19.83: fanlike tail from p.a. 280° to 320° [KIS02]. Jan. 31.13: "comet is quite unusual in appearance — asymmetrical or elongated; well condensed and unexpectedly brighter than predicted; Lumicon Swan-band or deep-sky filters were ineffective and the comet was noticeably harder (almost impossible!) to see" [SPR].

◇ *P/Shajn-Schaldach (1993k)* ⟹ 1993 Sept. 19.98: small extinction correction (< 0.1 mag) applied; $m_1 = 16.7$ when HS comparison stars are used [PRA01]. Dec. 15.20: comet's expected position close to a 10th-mag star [HAL].

◇ *Periodic Comet Shoemaker-Levy 9 (1993e)* ⟹ 1993 May 20.24: "due to the unusual appearance of this comet, the limiting brightness (for both observation attempts) is more uncertain than it would be for a more 'typical' comet" [HAL].

◇ *P/Slaughter-Burnham (1992w)* ⟹ 1993 Nov. 19.13: measured on composite image of 6-min total integration time [PRA01]. Nov. 20.01: coma dia. 14″; magnitude measured in aperture of dia. 7″ due to presence of a close brighter star [PRA01].

◇ *Periodic Comet Swift-Tuttle (1992t)* ⟹ 1992 Nov. 12.70: "coma was extended ~ 10′ in a kind of tail (p.a. 45°); the nucleus seemed to split in two parts, but some 15 min after this observation, the head was as normal; the 'split' probably was due to our atmosphere" [THO03]. Nov. 13.68: $m_2 = 7.5$ [KRY01]. Nov. 14.00: Fuji film used; unguided 30-sec exposure w/ 50-mm lens [KRO02]. Nov. 16.02: photograph taken as on Nov. 14.00, except w/ 205-mm lens, and some trailing resulted; no tail [KRO02]. Nov. 21.67: "bright nucleus with brightness ~ same as SAO 103784 ($m_v = 7.4$); faint tail structure" [THO03]. Nov. 22.72: "bright nucleus with brightness ~ same as SAO 103819 ($m_v = 7.2$); faint tail structure" [THO03].

◇ *P/Urata-Niijima (1993q)* ⟹ 1994 Jan. 7.54: slightly diffuse; very faint tail structure [SCO01].

◇ *Periodic Comet Väisälä 1 (1992u)* ⟹ 1993 Apr. 24.24: "comet larger and more diffuse than during previous observations; sky transparency conditions only fair, with some interference from nearby 8th-mag star" [HAL].

◇ *P/West-Kohoutek-Ikemura (1993o)* ⟹ 1993 Nov. 19.06: total mag measured in aperture of dia. 0′.8 (to suppress influence of light from nearby stars); faint outer coma of dia. 1′.8; tailward extension of coma continues into broad, faint tail; measurement of composite image of 4 min total integration time [PRA01]. Nov. 20.04: coma dia. 0′.6, faint halo w/ dia. 1′.6; broad tail from p.a. 259° to 311°; measured on composite image of 3 min total integration time [PRA01]. Dec. 15.17: coma small and diffuse, but fairly "dense" with relatively high surface brightness [HAL]. 1994 Jan. 10.22: comet vague and diffuse; moderately rich star field [HAL].

TABULATED DATA

The headings for the tabulated data are as follows: "DATE (UT)" = Date and time to hundredths of a day in Universal Time; "MM" = the method employed for estimating the total visual magnitude [B = Bobrovnikoff, M = Morris, S = Sidgwick/In-out — see October 1980 issue of *ICQ*, pages 69-73 — etc.; also, P stands for photographic magnitude, and photoelectrically-determined values fall under U, L, and V for the standard *U*, *B*, and *V*, respectively]. "MAG." = total visual magnitude estimate; a colon indicates that the observation is only approximate, due to bad weather conditions, *etc.*; a left bracket ([) indicates that the comet was not seen, with an estimated limiting magnitude given (if the comet IS seen, and it is simply estimated to be fainter than a certain magnitude, a "greater-than" sign (>) must be used, not a bracket). "RF" = reference for total magnitude estimates (B = Bobrovnikoff, M = Morris, S = Sidgwick, C = unfiltered CCD integration, c = same as 'C', but for nuclear magnitudes, V = electronic observations — usually CCD — with Johnson *V* filter, *etc.*; see pages 98-100 of the October 1992 issue, and page 60 of the April 1993 issue, for all of the 1- and 2-letter codes). "AP." = aperture in centimeters of the instrument used for the observations, usually given to tenths. "T" = type of instrument used for the observation (R = refractor, L = Newtonian reflector, B = binoculars, C = Cassegrain reflector, A = camera, T = Schmidt-Cassegrain reflector, S = Schmidt-Newtonian reflector, E = naked eye, *etc.*). "F/" and "PWR" are the focal ratio and power or magnification, respectively, of the instrument used for the observation — given to nearest whole integer (round even).

"COMA" = estimated coma diameter in minutes of arc; an ampersand (&) indicates an approximate estimate; an exclamation mark (!) precedes a coma diameter when the comet was not seen (*i.e.*, was too faint) and where a limiting magnitude estimate is provided based on an "assumed" coma diameter (a default size of 1′ or 30″ is recommended; cf. *ICQ* **9**, 100); a plus mark (+) precedes a coma diameter when a diaphragm was used electronically, thereby specifying the diaphragm size (i.e., the coma is almost always larger than such a specified diaphragm size). "DC" = degree of condensation on a scale where 9 = stellar and 0 = diffuse; a slash (/) indicates a value midway between the given number and the next-higher integer. "TAIL" = estimated tail length in degrees, to 0.01 degree if appropriate; again, an ampersand indicates a rough estimate. "PA" = estimated measured position angle of the tail to nearest whole integer in degrees (north = 0°, east = 90°). "OBS" = the observer who made the observation (given as a 3-letter, 2-digit code).

An asterisk between the published DATE and MM columns indicates that the observation is an updated version of one already published in a previous issue of the *ICQ*, *The Comet Quarterly*, or *The Comet*. An exclamation mark (!) in this same location indicates that the observer has corrected his estimate in some manner for atmospheric extinction; prior to September 1992, this was the standard symbol for noting extinction correction, but following publication of the extinction paper (July 1992 *ICQ*), this symbol is only to be used to denote corrections made using procedures different from that outlined by Green (1992, *ICQ* **14**, 55-59), and then only for situations where the observed comet is at altitude > 10°. Here again are the new special symbols: '&' = comet observed at altitude 20° or less with no atmospheric extinction correction applied; '$' = comet observed at altitude 10° or lower, observations corrected by the observer using procedure of Green (*ibid.*); for a correction applied by the observer using Tables Ia, Ib, or Ic of Green (*ibid.*), the letters 'a', 'w', or 's', respectively, should be used.

A complete list of the Keys to abbrevations used in the *ICQ* is available from the Editor for $4.00 postpaid. *Please note that data in archival form, and thus the data to be sent in machine-readable form, use a format that is different from that of the Tabulated data in the printed pages of the ICQ;* see pages 59-61 of the July 1992 issue for further information [note correction on page 140 of the October 1993 issue]. Further guidelines concerning reporting of data may be found on pages 59-60 of the April 1993 issue.

◇ ◇ ◇

Key to observers with observations published in this issue, *with 2-digit numbers between Observer Code and Observer's Name indicating source [16 = Japanese observers (c/o Akimasa Nakamura, Aichi, Japan); 35 = Brazilian observers (c/o Jose G. de Souza Aguiar, Campinas, S.P.); etc.]. Those with asterisks (*) preceding the 5-character code are new additions to the Observer Key:*

*BAK01	32	Gaspar Bakos, Budapest, Hungary
BAR		Sandro Baroni, Italy
BAR06		Alexandr R. Baransky, Okhnovka, Ukraine
BOA		Andrea Boattini, Italy
BOR		John E. Bortle, NY, U.S.A.
COM	11	Georg Comello, The Netherlands
CSU	32	Matyas Csukas, Romania
*DEM	23	Eduard Demencik, Slovak Republic
DES01		Jose Guilherme de Souza Aguiar, Brazil
DID		Richard Robert Didick, MA, U.S.A.
DIE02		Alfons Diepvens, Belgium
DVO	23	Denisa Dvorakova, Czech Republic
*FAB	23	Peter Fabian, Prievidza, Slovak Republic
FOG		Sergio Foglia, Italy
GAR02		Stephane Garro, France
GRA04	24	Bjoern Haakon Granslo, Norway
GRE		Daniel W. E. Green, U.S.A.
HAL		Alan Hale, U.S.A.
HAS02		Werner Hasubick, West Germany
HER02		Carl Hergenrother, NJ, U.S.A.
HOR02	23	Kamil Hornoch, Czechoslovakia
HUD02	23	T. Hudecek, Czech Republic
*ITO02	16	Kazuyuki Ito, Japan
KEE		Richard A. Keen, CO, U.S.A.
*KIS02	32	Laszlo Kiss, Szeged, Hungary
KOS	32	Attila Kosa-Kiss, Romania
KRO02		Gary W. Kronk, IL, U.S.A.
KRY01		Timur Valer'evich Kryachko, Russia
KUB	23	Pavel Kubicek, Czech Republic
KYS	23	J. Kysely, Czech Republic
LAR02	35	Marcos F. Lara, Brazil
LOO01		Frans R. van Loo, Belgium
LOU	35	Romualdo Lourencon, Brazil
LUE		Hartwig Luethen, West Germany
MEY		Maik Meyer, Germany
MIK		Herman Mikuz, Slovenia
MOD		Robert J. Modic, OH, U.S.A.
MOE		Michael Moeller, West Germany
NAG02	16	T. Nagata, Japan
NAK01	16	Akimasa Nakamura, Japan
NAP	35	Tasso A. Napoleao, Brazil
PER01		Alfredo Jose Serra Pereira, Portugal
*POP	23	Martin Popek, Czech Republic
PRA01	23	Petr Pravec, Czech Republic
PRI03	35	Walter Prini, Jr., Brazil
RAA01	08	Herbert Raab, Austria
REN		Alexandre Renou, France
SAR02	32	Krisztian Sarneczky, Hungary
SCH04	11	A. H. Scholten, The Netherlands
SCO01	08	James V. Scotti, AZ, U.S.A.
SHA04		Gregory T. Shanos, U.S.A.
*SKA01	23	Petr Skalak, Czech Republic
SPR		Christopher E. Spratt, BC, Canada
*STE10	23	Petr Stepan, Czech Republic
SZE02	32	Laszlo Szentasko, Hungary
THO03	24	Steinar Thorvaldsen, Norway
TOM01		Maura Tombelli, Italy
*VIC	32	Zoltan Vician, Hehalom, Hungary
WAR		Robert Warren, IN, U.S.A.
ZNO	23	Vladimir Znojil, Czech Republic

Comet Austin 1982 VI

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1982 08 09.18	B	5.1	AA	6.0	R	11	58	8	6			DES01
1982 08 10.16	B	5.2	AA	6.0	R	11	58	6	6			DES01

Comet Wilson 1987 VII

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1987 03 29.25	B	7.3	AA	5.0	B		7					NAP
1987 03 30.23	B	7.1	AA	6.0	R	12	58	6				LOU
1987 04 07.35	B	6.8	AA	6.0	R	12	58	6				LOU
1987 04 12.13	B	6.5	AA	5.0	B		7					NAP
1987 04 12.21	B	6.5	AA	6.0	R	12	58	6				LOU
1987 04 26.20	B	6.0	AA	6.0	R	12	58	7.5				LOU
1987 05 02.84	B	5.4	AA	5.0	B		7					NAP
1987 05 03.85	B	5.6	AA	5.0	B		7					NAP
1987 05 03.90	B	5.5	AA	6.0	R	12	58	7.5				LOU
1987 05 05.02	B	5.4	AA	6.0	R	12	58	5				LOU
1987 05 06.90	B	5.8	AA	6.0	R	12	58	4				LOU
1987 05 12.80	B	6.2	AA	5.0	B		7					NAP
1987 05 13.83	B	6.5	AA	5.0	B		7					NAP
1987 05 13.95	B	6.1	AA	6.0	R	12	58	4				LOU
1987 05 23.90	B	6.4	AA	6.0	R	12	58	4				LOU
1987 05 29.05	B	8.2	AA	6.0	R	12	58	2				LOU
1987 05 30.88	B	8.0	AA	5.0	B		7					NAP

Comet Bradfield 1987 XXIX

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1987 09 24.75	M	8.1	SC	8.0	B		10	3				HOR02
1987 10 20.93	B	6.2	SC	6.0	R	12	56	4				LOU
1987 11 22.94	B	5.1	SC	6.0	R	12	56	4				LOU
1987 11 24.92	B	5.8	SC	6.0	R	12	56	4				LOU
1988 01 01.94	B	8.7	SC	6.0	R	12	56	2				LOU
1988 01 02.92	B	8.7	SC	6.0	R	12	56	2				LOU
1988 02 03.74	M	9.5	S	13	L	8	69	1.5				HOR02
1988 02 11.80	M	9.4	S	8.0	B		10	6				HOR02

Comet Levy

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1987 12 17.99	B	9.2	SC	6.0	R	12	56		4			LOU

Comet Liller 1988 V

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1988 03 20.77	M	7.5	SC	8.0	B		10	1				HOR02
1988 04 10.79	M	6.0	SC	8.0	B		10	8		0.3		HOR02
1988 04 10.80	M	6.0	SC	5.0	B		10					HOR02
1988 04 11.80	M	6.0	SC	5.0	B		10					HOR02
1988 04 11.80	M	6.0	SC	8.0	B		10	6		0.3		HOR02
1988 04 14.80	M	5.9	SC	5.0	B		10					HOR02
1988 04 14.81	M	5.6	SC	8.0	B		10	4		0.3		HOR02
1988 04 15.81	M	5.7	SC	5.0	B		10					HOR02
1988 04 15.82	M	5.7	SC	8.0	B		10	5		0.6		HOR02
1988 04 17.80	M	5.9	SC	5.0	B		10					HOR02
1988 04 17.81	M	5.8	SC	8.0	B		10	5		0.5		HOR02
1988 04 18.80	M	5.9	SC	5.0	B		10					HOR02
1988 04 18.80	M	5.9	SC	8.0	B		10	7		0.7		HOR02
1988 04 23.82	M	5.8	SC	5.0	B		10					HOR02
1988 04 23.83	M	5.8	SC	8.0	B		10	4		0.5		HOR02

Comet Liller 1988 V [cont.]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1988 04 24.81	M	5.8	SC	5.0	B		10					HOR02
1988 04 24.81	M	5.8	SC	8.0	B		10	5		0.9		HOR02
1988 05 06.84	M	6.2	SC	5.0	B		10					HOR02
1988 05 06.84	M	6.2	SC	8.0	B		10	8				HOR02
1988 05 07.88	M	5.9	SC	8.0	B		10	7		0.7		HOR02
1988 05 09.84	M	6.2	SC	8.0	B		10	5		0.8		HOR02
1988 05 09.84	M	6.3	SC	5.0	B		10					HOR02
1988 05 09.92	B	6.6	SC	3	B		6		5			KUB
1988 06 03.89	M	7.5	SC	8.0	B		10	7		0.1		HOR02
1988 06 17.91	M	8.6	SC	8.0	B		10					HOR02

Comet Austin 1990 V

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1990 03 06.19	B	6.6	AA	5.0	B		7					PRI03
1990 05 01.08	B	5.7	SP	10.0	B		25		3			KUB
1990 05 03.06	B	5.5	SP	6.0	B		20	11	3	0.85	61	KUB
1990 05 04.06	B	5.5	SP	6.0	B		20					KUB
1990 05 18.90	B	6.3	SP	10.0	B		25					KUB
1990 05 19.26	B	5.5	AA	5.0	B		7					PRI03
1990 05 20.24	B	5.7	AA	5.0	B		7					PRI03
1990 05 21.31	B	6.1	AA	5.0	B		4					LAR02
1990 05 23.13	B	5.6	AA	5.0	B		7					PRI03
1990 05 25.13	B	5.8	AA	5.0	B		7					PRI03
1990 05 25.95	B	6.0	SP	6.0	B		20	15				KUB
1990 05 26.14	B	5.5	AA	5.0	B		7					PRI03
1990 05 27.22	B	5.7	AA	5.0	B		7					PRI03
1990 05 28.13	B	5.7	AA	5.0	B		7					PRI03
1990 05 29.04	B	6.5	SP	10.0	B		25	12	1			KUB

Comet Levy 1990 XX

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1990 07 18.29	B	7.0	AA	5.0	B		7			0.30		NAP
1990 07 21.16	B	7.0	AA	5.0	B		7					NAP
1990 07 29.24	B	6.7	AA	5.0	B		7					NAP
1990 08 23.88	B	3.8	SP	5	R	5	4					KUB
1990 09 09.95	B	4.5	AA	5.0	B		7	30				NAP
1990 09 10.97	B	4.7	AA	5.0	B		7					NAP
1990 09 15.92	B	4.8	AA	5.0	B		7					NAP
1990 09 25.92	B	5.3	AA	5.0	B		7					NAP

Comet Shoemaker-Levy 1992 XIX = 1991a1

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1992 06 31.85	M	7.7	A	11	L	7	26	6	3			KRY01
1992 07 04.83	B	7.6	SC	11	L	7	26	7	4			KRY01
1992 07 13.78	B	7.9	S	11	L	7	26	7	5			KRY01
1992 07 14.77	M	7.9	S	11	L	7	26	7	5			KRY01
1992 07 15.81	S	8.6	S	11	L	7	26	6	5			KRY01
1992 07 17.76	B	8.5	S	11	L	7	26	8	4			KRY01
1992 07 23.75	B	8.4	S	11	R	7	20	6	4			KRY01
1992 07 25.75	B	8.0	S	11	R	7	20	7	4			KRY01

Comet Mueller 1992 XX = 1993d

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 07 19.51	C	18.5:	HS	60.0	Y	6		0.1				NAK01

Comet Spacewatch 1992h

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 05 12.23	I	[13.5:		41	L	4	183					HAL
1993 05 20.27	I	[14.0:		41	L	4	183					HAL
1993 06 14.18	I	[13.5:		41	L	4	183					HAL
1993 10 25.50	I	[13.5:		41	L	4	183					HAL
1994 01 05.73	C	15.4	HS	30	T	5						RAA01
1994 01 10.16	I	[13.5:		41	L	4	183					HAL
1994 01 15.77	C	15.1	HS	30	T	5						RAA01

Comet Mueller 1993a

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 01 21.58	C	14.0	EA	60.0	Y	6		0.6				NAK01
1993 01 21.60	S	13.3	AC	60.0	Y	8	200	0.9	3			NAK01
1993 02 14.58	S	13.3	AC	60.0	Y	8	200	0.6	4			NAK01
1993 02 19.66	S	13.3	AC	60.0	Y	8	200	0.8	3			NAK01
1993 03 13.57	S	13.1	AC	60.0	Y	8	200	0.8	4/			NAK01
1993 03 21.52	S	12.8:	HS	60.0	Y	8	240	0.5	3/			NAK01
1993 03 22.46	C	13.9	EA	60.0	Y	6		0.75				NAK01
1993 03 22.48	S	13.1	AC	60.0	Y	8	200	1.1	2/			NAK01
1993 04 14.49	C	13.7	HS	60.0	Y	6		0.7				NAK01
1993 04 25.46	C	14.0	HS	60.0	Y	6		0.5				NAK01
1993 05 10.18	S	13.1	AA	41	L	4	183					HAL
1993 05 11.47	C	14.0	HS	60.0	Y	6		0.5				NAK01
1993 05 20.16	S	13.1	AA	41	L	4	183					HAL
1993 06 07.12	S	[12.6	GA	35.9	L	7	164	! 0.5				MOD
1993 06 13.14	S	[12.6	GA	35.9	L	7	164	! 0.5				MOD
1993 06 16.13	S	[13.5	GA	35.9	L	7	164	! 0.5				MOD
1993 06 17.14	M	13.3	GA	35.9	L	7	164	0.6	4			MOD
1993 06 30.35	S	[11.5	GA	35.9	L	7	164	! 0.5				MOD
1993 07 17.35	S	[11.7	GA	20.0	L	5	68	! 1.0				MOD
1993 07 22.36	S	13.0	GA	35.9	L	7	85	0.5	2			MOD
1993 08 12.83	S	11.5	AC	33.4	L	4	214	2	7	0.02	270	SZE02
1993 08 14.16	S	12.2	AC	25	L	6	135	3.0	4			TOM01
1993 08 14.35	S	[12.6	GA	35.9	L	7	164	! 0.5				MOD
1993 08 18.02	S	10.8	A	20.0	T	10	76	& 3	2/			COM
1993 08 19.87	S	10.6	A	20.0	T	10	76	& 3	1/			COM
1993 08 20.02	S	11.3	AC	26.0	L	6	89	2	6			VIC
1993 08 21.45	M	11.7	NP	20	L	6	61					HAL
1993 08 22.31	S	11.0:	GA	20	L	8	130	1	0/			DID
1993 08 22.38	M	12.0	AC	35.9	L	7	85	1.3	3			MOD
1993 08 23.30	S	11.3	GA	20	L	8	130	1	0/			DID
1993 08 24.89	S	11.0	A	30.0	L	5	148	& 2	1/			SCH04
1993 08 26.34	S	11.3	GA	20	L	8	130	2	3			DID
1993 08 26.38	M	12.0	AC	35.9	L	7	85	1.3	4			MOD
1993 08 26.39	M	11.6	AC	20.0	L	5	35	1.4	2			MOD
1993 08 27.31	S	11.2	GA	20	L	8	130	2	3			DID
1993 08 28.09	S	10.8	A	20.0	T	10	76	& 4	2			COM
1993 08 29.12	S	11.1	AC	25	L	4	53	1	6			LOO01
1993 08 29.19	S	10.7	AC	15.0	L	4	26	& 3				PER01
1993 08 29.34	S	11.0	GA	20	L	8	130	2	2			DID
1993 08 30.19	S	10.3	AC	15.0	L	4	26	& 4				PER01
1993 09 04.83	S	11.2	AC	15.2	L	5	76	2	3			MOE
1993 09 05.85	S	11.2	AC	15.2	L	5	76	2	2			MOE
1993 09 06.81	B	10.6	HS	11	L	8	32	1.5	2			KYS
1993 09 06.82	S	10.4	AS	13.0	L	6	36	3	4			MEY
1993 09 06.82	S	11.3	HS	15	R	15	90	2	1			KUB
1993 09 06.84	M	11.3	HS	13	L	8	69					HOR02
1993 09 07.80	B	10.7	HS	11	L	8	54	1.0	4			KYS
1993 09 07.81	B	11.0	HS	25	L	15	60	3	5			STE10

Comet Mueller 1993a [cont.]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 09 07.81	S	10.3	AS	13.0	L	6	36	3.5	4			MEY
1993 09 07.86	S	11.0	AC	15.2	L	5	76	2	2			MOE
1993 09 08.07	M	11.7	GA	20.0	L	5	68	1.3	3			MOD
1993 09 09.81	B	11.0	HS	25	L	15	60	3	4			STE10
1993 09 11.13	S	10.8	GA	20	L	8	130	2	0/			DID
1993 09 11.80	B	10.2	HS	11	L	8	32	1.5	3			KYS
1993 09 12.10	S	10.8:	GA	20	L	8	130	2	1			DID
1993 09 13.36	S	10.8	GA	20	L	8	130	2	2	0.03	210	DID
1993 09 13.81	S	11.2	AC	33.4	L	4	214	2	4			SZE02
1993 09 14.79	S	10.6:	GA	11	L	7	40	2	2			BAR06
1993 09 14.80	B	10.2	HS	11	L	8	54	1.5	2			KYS
1993 09 14.89	S	10.0:	AC	13.0	L	6	36	3.5	4			MEY
1993 09 15.46	M	10.9	NP	20	L	6	61					HAL
1993 09 15.80	S	10.2	HS	11	L	8	54	2	2			KYS
1993 09 15.81	B	10.1	HS	11	L	8	32					KYS
1993 09 15.81	S	10.7	GA	11	L	7	40	2	4			BAR06
1993 09 16.79	M	10.5	HS	13	L	8	69	2.5	2			HOR02
1993 09 16.82	B	10.6	HS	11	L	8	54					KYS
1993 09 16.82	S	9.9	S	5.6	R	14	40	1	2			DEM
1993 09 16.82	S	10.4	HS	11	L	8	54	2.5	3			KYS
1993 09 16.83	S	10.5	HS	15	R	15	56	2	1			KUB
1993 09 16.83	S	10.9	GA	11	L	7	40	3	4			BAR06
1993 09 16.93	B	10.5	AA	12	L	6	40	3	4/			REN
1993 09 17.83	S	11.0	GA	11	L	7	40	1.5	3			BAR06
1993 09 17.88	S	11.0	AC	26.0	L	6	79	2	6			VIC
1993 09 18.08	S	10.3	AC	25	L	4	53	2.5	3			LOO01
1993 09 18.12	S	10.4	HS	11	L	8	32	1.5	2			KYS
1993 09 18.81	M	9.9	HS	6.5	L	8	33	& 3	1			HOR02
1993 09 18.81	S	10.1	AC	15.2	L	5	44	3	3			MOE
1993 09 18.82	S	10.1	AC	10.0	B		25	4	4			MEY
1993 09 18.82	S	10.4	HS	11	L	8	32	1.5	4			KYS
1993 09 18.83	S	9.9	S	5.6	R	14	40	1.5	2			DEM
1993 09 18.84	S	10.0	HS	20.3	T	10	154	2.0	4			LUE
1993 09 18.88	S	10.6	AC	30.5	L	5	85	2	6			VIC
1993 09 19.03	S	10.2	AC	25	L	4	53	2.5	4			LOO01
1993 09 19.78	S	9.8	S	5.6	R	14	40	1.5	2			DEM
1993 09 19.79	S	9.8	HS	11	L	8	32	2	2			KYS
1993 09 19.80	B	9.9	HS	11	L	8	32					KYS
1993 09 19.80	S	10.2	AC	15.2	L	5	76	3	4			MOE
1993 09 19.82	S	10.1	AC	10.0	B		25	3.5	4			MEY
1993 09 19.90	M	10.4	HS	16	L	8	48	2.2				POP
1993 09 20.01	S	10.6	GA	20	L	8	130	2	2			DID
1993 09 20.02	! C	10.7	L	18	L	6		3.8		0.14	304	PRA01
1993 09 20.02	S	10.5	AC	31.7	L	6	68	1.4	5			BOR
1993 09 20.09	B	10.2	AA	12	L	6	40	3	4			REN
1993 09 20.12	S	10.3	AC	25	L	4	53	2.5	4			LOO01
1993 09 20.13	S	10.0	HS	11	L	8	32	1.5	2			KYS
1993 09 20.14	B	10.1	HS	11	L	8	32					KYS
1993 09 20.30	S	10.5	GA	20	L	8	130	2	3			DID
1993 09 20.78	S	10.1	HS	11	L	8	32	1.5	3			KYS
1993 09 20.80	S	9.8	S	5.6	R	14	40	2	2			DEM
1993 09 20.80	S	10.8	AC	33.4	L	4	214	3	4			SZE02
1993 09 20.84	S	10.1	AC	15.2	L	5	76	3	4			MOE
1993 09 21.00	S	10.0	AC	10.0	B		25	3	4			MEY
1993 09 21.04	S	10.7	GA	11	L	7	40	2	4			BAR06
1993 09 21.78	M	10.2	HS	10.0	B		25	2.5	4			ZNO
1993 09 21.78	S	10.0	HS	11	L	8	54	1.2	2			KYS
1993 09 21.79	S	9.7	S	5.6	R	14	40	2	2			DEM
1993 09 21.83	S	10.7	GA	11	L	7	40	3	4			BAR06

Comet Mueller 1993a [cont.]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 09 21.87	S	10.1	AC	15.2	L	5	44	3	3			MOE
1993 09 22.21	S	10.1	AA	20	T	10	125	2.5	3			SPR
1993 09 22.78	S	9.7	S	5.6	R	14	40	2	2			DEM
1993 09 22.78	S	10.3	HS	11	L	8	54	1.5	2			KYS
1993 09 22.80	M	11.0	HS	13	L	8	69	1.5	2			HOR02
1993 09 23.00	S	10.1:	AC	10.0	B		25	3	4			MEY
1993 09 23.04	S	10.9	GA	11	L	7	40	2	4			BAR06
1993 09 23.10	S	10.7	AC	33.4	L	4	214	3	6	0.02	315	SZE02
1993 09 23.13	S	10.2	HS	11	L	8	54	2	2			KYS
1993 09 23.14	B	10.3	HS	11	L	8	32	2	2			KYS
1993 09 23.77	S	10.3	HS	11	L	8	96	1.5	2			KYS
1993 09 24.04	S	11.0	GA	11	L	7	40	3	3			BAR06
1993 09 24.14	S	10.4	HS	11	L	8	32	2	2			KYS
1993 09 24.20	S	9.9	AA	20	T	10	64	3	3			SPR
1993 09 24.20	S	10.1	AC	15.0	L	4	26	& 4	2			PER01
1993 09 24.37	M	11.0	GA	20.0	L	5	35	2.7	3/			MOD
1993 09 24.78	S	10.3	HS	11	L	8	54	1.5	2			KYS
1993 09 25.00	S	9.7	AC	10.0	B		25	4	4			MEY
1993 09 25.08	B	10.0	AC	15.0	L	10	54	3	2			CSU
1993 09 25.14	B	10.3	HS	11	L	8	54					KYS
1993 09 25.14	S	10.2	HS	11	L	8	54	2.5	2			KYS
1993 09 25.26	S	10.1	GA	20	L	8	130	3	3	0.06	285	DID
1993 09 25.37 a	S	10.2	AC	31.7	L	6	68	2.0	5			BOR
1993 09 26.47	M	10.5	NP	20	L	6	61					HAL
1993 09 27.78	S	10.1	HS	11	L	8	54	1.5				KYS
1993 09 28.77	S	9.5	HS	11	L	8	54	1.5				KYS
1993 09 30.82	S	9.8	HS	10.0	B		25	3.0	3			ZNO
1993 10 04.00 a	S	9.9	AC	31.7	L	6	68	1.9	4			BOR
1993 10 04.01	M	10.8	GA	35.9	L	7	45	1.8	3/			MOD
1993 10 04.03	M	10.5	GA	20.0	L	5	35	2.0	3			MOD
1993 10 04.98	S	10.0:	GA	20	L	8	130	3	2			DID
1993 10 05.00 a	S	9.8	AC	31.7	L	6	68	2.2	4			BOR
1993 10 05.76	S	9.7	S	5.6	R	14	56	3	2			DEM
1993 10 05.77	S	9.6:	AC	10.0	B		25	3.5	3/			MEY
1993 10 05.79	M	11.0:	HS	13	L	8	69	& 3	3			HOR02
1993 10 05.79	S	9.8	S	10.0	B		25	3.5	4	0.08	320	ZNO
1993 10 06.00 a	S	9.8	AC	31.7	L	6	68	1.8	5			BOR
1993 10 06.00	S	10.0	GA	20	L	8	130	3	3			DID
1993 10 06.10	M	10.7	GA	20.0	L	5	35	2.2	3			MOD
1993 10 06.77	M	10.1	HS	13	L	8	69		3			HOR02
1993 10 07.00	S	10.0	AC	20	L	8	130	3	3			DID
1993 10 07.07	M	10.7	GA	20.0	L	5	35	2.2	2/			MOD
1993 10 07.76	S	9.6	AC	15.2	L	5	44	3.5	3			MOE
1993 10 07.78	B	9.6	S	15	R	15	90	2	1			KUB
1993 10 07.79	S	9.8	S	15	R	15	90					KUB
1993 10 07.82	S	9.3	AC	13.0	L	6	36	3	4			MEY
1993 10 08.10	M	10.7	GA	20.0	L	5	35	2.2	2/			MOD
1993 10 08.21	S	9.2	AA	20	T	10	64	3.5	4			SPR
1993 10 08.54	S	10.3	NP	15.0	R	5	25	3	3/			NAG02
1993 10 08.80	B	10.5	AA	12	L	6	40	& 2.5	3			REN
1993 10 08.83	M	9.9	S	13	L	8	69	& 3	3/			HOR02
1993 10 09.49	S	10.3	NP	15.0	R	5	25	3	4			NAG02
1993 10 09.76	B	9.9	S	11	L	8	32	3	6			KYS
1993 10 09.76	S	9.8	S	11	L	8	32					KYS
1993 10 09.77	B	10.1	S	15	R	15	90	3	1			KUB
1993 10 09.80	S	9.3	AC	13.0	L	6	36	3.5	4			MEY
1993 10 09.80	S	9.7	AC	33.4	L	4	214	4	5	0.2	320	SZE02
1993 10 09.84	S	10.6	AC	12.0	L	5	31	2	5			VIC
1993 10 09.87	S	10.7	AC	30.5	L	5	85	4	8	0.1	305	VIC

Comet Mueller 1993a [cont.]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 10 09.91	S	9.6	AC	15.2	L	5	44	3.5	3			MOE
1993 10 10.18	S	10.4	NP	10.8	L	4	43					HAL
1993 10 10.19	B	9.3	S	8.0	B		20	4	2			KRO02
1993 10 10.19	B	9.6	S	33.3	L	4	56	2.7	5			KRO02
1993 10 10.20	B	9.8:	HS	33.3	L	4	56	2.8				KRO02
1993 10 10.77	S	9.3	AC	13.0	L	6	36	4.5	4/			MEY
1993 10 10.77	S	9.7	AC	15.2	L	5	44	3.5	3			MOE
1993 10 10.84	B	9.8	S	11	L	8	32	2.5	5			KYS
1993 10 10.84	B	9.9	AA	15.0	L	10	54	5	2			KOS
1993 10 10.84	S	9.9	S	11	L	8	32					KYS
1993 10 11.00	S	10.0	GA	20	L	8	130	3	3			DID
1993 10 11.03	S	9.8	AC	31.7	L	6	68	2.4	5			BOR
1993 10 11.06	S	10.2:	CD	35.6	L	4	50	& 2.5	5/	?		GRE
1993 10 11.15	M	10.6	GA	20.0	L	5	35	2.5	3			MOD
1993 10 11.77	S	9.8	S	5.6	R	14	56	3.5	1			DEM
1993 10 12.01	S	9.8	AC	31.7	L	6	68	2.6	5			BOR
1993 10 12.02	S	9.9	GA	20	L	8	130	4	4	0.12	300	DID
1993 10 12.20	B	9.1:	S	8.0	B		20	4	2			KRO02
1993 10 13.02	B	10.4	AA	12	L	6	40	3	4			REN
1993 10 13.20	B	9.2	S	8.0	B		20	4				KRO02
1993 10 13.78	M	9.8	S	13	L	8	69		3/			HOR02
1993 10 13.78	S	9.8	S	10.0	B		25	3.5	5	0.15		ZNO
1993 10 14.00	S	9.9	GA	20	L	8	130	4	4	0.1	280	DID
1993 10 14.02	S	9.2	AC	31.7	L	6	68	3.5	5/	?	230	BOR
1993 10 14.08	S	9.0	BD	20.3	T	10	80	2.8	4/			GRA04
1993 10 14.11	M	10.6	GA	20.0	L	5	35	2.7	4			MOD
1993 10 15.16	B	9.5	S	33.3	L	4	56	2.9	5			KRO02
1993 10 15.81	S	9.5	AC	15.2	L	5	44	3.5	4			MOE
1993 10 15.91	S	9.9	AA	11.4	L	8	45	5	5			FOG
1993 10 15.98	S	9.2	A	30.0	L	5	60	4	5			SCH04
1993 10 16.75	S	9.4	AC	15.2	L	5	44	4	4			MOE
1993 10 16.80	S	9.5	AC	44.5	L	4	82	3	6	0.05	300	SAR02
1993 10 16.80	S	9.6	AC	44.5	L	4	82	4	7	0.05	290	SZE02
1993 10 16.88	B	10.0	S	10	B		25	6	3			KUB
1993 10 16.89	B	9.8	S	10	B		25	7				SKA01
1993 10 16.96	S	9.2	A	30.0	L	5	60	4	5			SCH04
1993 10 17.76	S	9.3	AC	15.2	L	5	44	4	5			MOE
1993 10 17.79	S	9.1	AC	13.0	L	6	36	4	5			MEY
1993 10 17.84	B	10.0	S	10	B		25	6.5	3			KUB
1993 10 17.84	S	9.3	A	30.0	L	5	60	4	4			SCH04
1993 10 18.75	B	10.1	S	10	B		25	3.5	3			KUB
1993 10 18.75	S	9.4	AC	15.2	L	5	44	4	5			MOE
1993 10 18.76	S	9.2	AC	13.0	L	6	36	4.5	5			MEY
1993 10 18.78	S	9.8	GA	11	L	7	40	4	5			BAR06
1993 10 18.83	S	9.5	A	30.0	L	5	60	& 3	6			SCH04
1993 10 19.02	S	9.3	AC	31.7	L	6	68	2.6	5/			BOR
1993 10 19.06	! V	10.2	L	18	L	6		3.7		>0.19	2	PRA01
1993 10 19.74	S	9.3	AC	15.2	L	5	44	5	4			MOE
1993 10 19.77	S	9.9	GA	11	L	7	40	6	4			BAR06
1993 10 19.78	S	9.1	AC	13.0	L	6	36	4	5			MEY
1993 10 19.84	S	9.8	HS	20.3	T	10	66	3.0	5	0.08	80	LUE
1993 10 19.97	S	9.9	GA	20	L	8	130	4	5	0.12	275	DID
1993 10 20.90	B	9.8	VF	12	L	6	40	3.5	3			REN
1993 10 20.96	S	9.5	AA	15.0	L	4	26	& 4	4			PER01
1993 10 22.01	S	9.0	BD	20.3	T	10	80	3.3	4			GRA04
1993 10 22.14	B	9.6	S	33.3	L	4	56	3.2	5			KRO02
1993 10 22.22	S	9.6	AA	15.0	L	4	26	& 3	5			PER01
1993 10 22.40	B	9.2	S	8.0	B		20	4.5	3			KRO02
1993 10 23.14	S	9.7	GA	11.5	L	8	50	5	5			DID

Comet Mueller 1993a [cont.]

DATE (UT)		MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 10 23.28		S	9.1	AC	31.7	L	6	68	2.6	6			BOR
1993 10 23.37		M	10.2	GA	20.0	L	5	35	2.2	4			MOD
1993 10 23.46		B	9.3	S	8.0	B		20	4	4			KRO02
1993 10 23.81		S	10.2	NP	15.0	R	5	25	3	4/			NAG02
1993 10 24.36		S	9.6	GA	5.0	B		10	7	1			MOD
1993 10 24.37		M	10.1	GA	20.0	L	5	35	2.9	4			MOD
1993 10 25.22		S	9.5	AA	15.0	L	4	26	& 3	6			PER01
1993 10 25.37		M	10.2	GA	20.0	L	5	35	3.2	4			MOD
1993 10 25.38	!	M	10.3	NP	41	L	4	83					HAL
1993 10 25.38	a	S	9.1	AC	31.7	L	6	68	3.6	5			BOR
1993 10 25.38		S	9.5	GA	5.0	B		10	7	1			MOD
1993 10 25.74		S	9.6:	AC	15.2	L	5	44	3.5	3			MOE
1993 10 25.78		S	9.5	AA	11.4	L	8	45	8	5			FOG
1993 10 25.96		S	9.3	AC	33.4	L	4	214	3	1	0.03	110	SAR02
1993 10 26.02		S	9.2	AC	33.4	L	4	61	3	1	0.1	120	SZE02
1993 10 26.13		S	9.0	BD	20.3	T	10	80	3.0	4			GRA04
1993 10 26.13		S	9.0	BD	20.3	T	10	80	3.0	4			GRA04
1993 10 26.13		S	9.4	S	20.3	T	10	80					GRA04
1993 10 26.13		S	9.4	S	20.3	T	10	80					GRA04
1993 10 26.44		M	10.2	GA	20.0	L	5	35	2.5	3/			MOD
1993 10 27.20		S	9.0	BD	20.3	T	10	80	2.9	3/			GRA04
1993 10 27.20		S	9.0	BD	20.3	T	10	80	2.9	3/			GRA04
1993 10 27.20		S	9.3	S	20.3	T	10	80					GRA04
1993 10 27.20		S	9.3	S	20.3	T	10	80					GRA04
1993 10 27.73		M	10.2	S	10	B		25	& 3	4			ZNO
1993 10 27.82		S	10.0	NP	15.0	R	5	25	4	4/			NAG02
1993 10 31.73		S	10.0	S	11	L	8	54	3	4			KYS
1993 11 02.72		S	9.0:	AC	13.0	L	6	36	& 4	4/			MEY
1993 11 03.43		S	9.7	NP	15.0	R	5	25	3	4			NAG02
1993 11 03.45		S	9.4	NP	20	L	6	46	3				NAK01
1993 11 03.72		S	10.0:	GA	11	L	7	40	5	2			BAR06
1993 11 03.74		S	8.9	AC	13.0	L	6	36	3.5	5			MEY
1993 11 04.73		S	8.8	AC	13.0	L	6	36	3	5			MEY
1993 11 04.82		B	9.8	VF	12	L	6	40	4	3			REN
1993 11 04.84		S	9.3	A	11.0	L	7	32	& 6	0/			SCH04
1993 11 06.24		M	10.1	AA	41	L	4	83					HAL
1993 11 07.04		S	8.5	S	28	T	10	140	10	8	&0.25	135	WAR
1993 11 07.27		S	9.6	AA	20	T	10	64	3	4			SPR
1993 11 07.78		S	9.0	AC	33.4	L	4	61	2	8			SZE02
1993 11 08.01		S	9.0	NP	5.0	B		10	5				BOR
1993 11 08.01		S	9.0	NP	31.7	L	6	68	5.0	5/			BOR
1993 11 08.01		S	9.2	GA	20	L	8	46	5	5	0.16	340	DID
1993 11 08.15		S	9.4	AA	20	T	10	64	3	3			SPR
1993 11 08.97		S	9.1	GA	11.5	L	8	50	5	4	0.16	55	DID
1993 11 09.00		S	9.2	GA	20	L	8	46	5	5	0.16	35	DID
1993 11 09.01		S	8.9	NP	31.7	L	6	68	3.8	6			BOR
1993 11 09.01		S	9.0	NP	8.0	B		20	4.5	3			BOR
1993 11 09.08		M	9.8	GA	20.0	L	5	35	2.5	3/			MOD
1993 11 10.07		B	9.5	S	33.3	L	4	56	2.6	5			KRO02
1993 11 10.13		M	8.6	AA	15.3	L	3	16	5	2			KEE
1993 11 10.15	a	S	9.0	NP	31.7	L	6	68	3.3	5/			BOR
1993 11 10.25		M	10.2	GA	20.0	L	5	35	2.1	3			MOD
1993 11 10.86		B	9.5	VF	12	L	6	40	5	3			REN
1993 11 11.01	a	S	8.9	AC	31.7	L	6	68	3.6	5/			BOR
1993 11 11.03		B	9.3	S	33.3	L	4	56	3.9	5			KRO02
1993 11 11.05		S	9.5	GA	20	L	8	46	5	5			DID
1993 11 11.12		S	9.5	AA	20	T	10	64	3	4			SPR
1993 11 11.72		S	9.6	GA	11	L	7	40	3	4			BAR06
1993 11 12.25		S	9.8	AA	20	T	10	64	3	3			SPR

Comet Mueller 1993a [cont.]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 11 12.71	S	9.0	AC	15.2	L	5	44	5	3			MOE
1993 11 12.72	S	9.4	GA	11	L	7	40	4	4			BAR06
1993 11 12.76	B	9.4	VF	12	L	6	40	5.5	3/			REN
1993 11 12.83	S	8.5	AC	13.0	L	6	36	3.5	5			MEY
1993 11 13.07	S	8.8	NP	31.7	L	6	68	3.6	5/			BOR
1993 11 13.11	S	9.4	AA	20	T	10	64	4	3			SPR
1993 11 13.70	S	9.8	GA	11	L	7	40	3	3			BAR06
1993 11 13.73	S	8.7	AC	13.0	L	6	36	3.5	4/			MEY
1993 11 13.80	M	9.3	S	13	L	8	69	3.2	4/			HOR02
1993 11 13.81	M	9.6	S	13	L	8	69	2.5	4			DVO
1993 11 13.98	S	9.4	AA	15.0	L	4	26	& 4	4			PER01
1993 11 14.12	S	9.3	AA	20	T	10	64	3	3/			SPR
1993 11 14.76	B	9.4	VF	12	L	6	40	5	3/			REN
1993 11 14.87	S	9.9	S	11	L	8	54	2.5	3			KYS
1993 11 14.95	S	9.5	AA	15.0	L	4	26	& 3	5/			PER01
1993 11 15.48	S	9.6	NP	15.0	R	5	25	4	3/			NAG02
1993 11 15.81	B	9.4	VF	12	L	6	40	5.5	3/			REN
1993 11 16.06	S	9.5	GA	20	L	8	46	5	8	0.08	35	DID
1993 11 16.11	S	9.2	AA	20	T	10	64	3	4			SPR
1993 11 16.86	S	9.1	AC	15.2	L	5	44	5	1			MOE
1993 11 16.96	! V	9.8	YF	20.0	T	2		& 7	5			MIK
1993 11 17.04	S	8.9	NP	31.7	L	6	68	3.2	5	?		BOR
1993 11 17.06	S	9.0	AA	31.8	L	4	33	6	3			KEE
1993 11 17.72	S	9.3	AC	15.2	L	5	44	4	2			MOE
1993 11 17.76	M	9.8	S	13	L	8	69		4			HOR02
1993 11 17.76	S	10.3	GA	11	L	7	40	2.5	4			BAR06
1993 11 17.85	S	9.5	S	10.0	B		25					HUD02
1993 11 17.89	S	9.2	AC	15.2	L	5	76	4.5	2			MOE
1993 11 17.93	S	9.4	S	10.0	B		25	1.5				FAB
1993 11 18.11	S	9.1	AA	20	T	10	64	2.5	4			SPR
1993 11 18.52	S	9.6	NP	15.0	R	5	25	4	4			NAG02
1993 11 18.72	S	9.1	AC	15.2	L	5	44	4.5	3			MOE
1993 11 18.74	M	9.8	S	10	B		25	3.5	4	0.2		ZNO
1993 11 18.77	S	9.2	S	5.6	R	14	40	5	3			DEM
1993 11 18.78	B	9.6	AC	33.4	L	4	214	1.5	7	0.17	80	SZE02
1993 11 18.78	S	9.5	AC	33.4	L	4	214	1.5	6	0.1	70	SAR02
1993 11 18.78	S	10.4	GA	11	L	7	40	2	3			BAR06
1993 11 18.81	S	9.3	S	13	L	8	69		4			HOR02
1993 11 18.83	B	9.6	S	10.0	B		25	2.0				FAB
1993 11 19.04	M	10.1	GA	20.0	L	5	35	2.0	3/			MOD
1993 11 19.74	S	9.1:	S	11	L	8	54	2.5	2			KYS
1993 11 19.81	S	8.9:	S	5.6	R	14	40	5.5	3			DEM
1993 11 20.80	S	9.2	AC	15.2	L	5	44	4	3			MOE
1993 11 21.17	B	9.5	S	33.3	L	4	56	2.5	3			KRO02
1993 11 22.55	S	9.5	NP	15.0	R	5	25	3	4			NAG02
1993 11 23.01	a S	9.0	NP	31.7	L	6	68	3	5			BOR
1993 11 27.76	S	9.2	AC	33	L	4	56	3.5	4			BOA
1993 11 29.25	! M	10.1	AA	20	L	6	55					HAL
1993 12 03.73	S	9.4	AA	10.0	L	10	50	3	6			FOG
1993 12 04.09	M	9.8	AA	20	L	6	55					HAL
1993 12 04.47	S	9.5	NP	15.0	R	5	31	3	4/			NAG02
1993 12 04.83	S	9.8	HS	5.6	R	14	40	3	2			DEM
1993 12 04.87	S	8.6	AA	15	R	15	85	2	2			DIE02
1993 12 04.89	S	9.8	AC	15.2	L	5	44	4	2			MOE
1993 12 05.00	S	9.0:	AA	20.0	T	10	50	& 1.7	2			SHA04
1993 12 05.11	S	8.9	AA	20	T	10	64	3.5	5			SPR
1993 12 05.69	S	10.2	HS	11	L	8	54	2.0	2			KYS
1993 12 05.78	B	10.6	VF	12	L	6	40	4.5	3			REN
1993 12 05.79	S	8.6	AA	15	R	15	85	& 2.5	3			DIE02

Comet Mueller 1993a [cont.]

DATE (UT)		MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 12 06.12		B	9.3	S	33.3	L	4	56	2.2	4			KRO02
1993 12 06.18		S	9.1	AA	20	T	10	64	3	4			SPR
1993 12 07.05		B	9.4	S	33.3	L	4	56	2.5	5			KRO02
1993 12 07.91		S	8.6	AA	15	R	15	85	2	2			DIE02
1993 12 08.05		B	9.5	S	33.3	L	4	56	2.0	5			KRO02
1993 12 08.39		S	9.7	AC	20	L	6	46	3.5	3			NAK01
1993 12 08.48		S	9.5	NP	15.0	R	5	25	4	3/			NAG02
1993 12 08.76		S	9.0	AC	33.4	L	4	214	1.2	5	0.05	75	SZE02
1993 12 08.77		S	9.1	BD	20.3	T	10	80	2.5	3/			GRA04
1993 12 08.77		S	9.1	S	20.3	T	10	80					GRA04
1993 12 08.97		S	9.1	GA	20	L	8	46	6	5	0.01	335	DID
1993 12 09.02		S	9.1	NP	31.7	L	6	68	3.9	6			BOR
1993 12 09.05		S	9.5:	S	33.3	L	4	56	1.9	5			KRO02
1993 12 09.79		S	8.8	AA	15	R	15	85	2	1			DIE02
1993 12 09.83		S	9.4	AA	10.0	B		25	2.3	4			HAS02
1993 12 09.98		S	9.1	GA	20	L	8	46	6	3		335	DID
1993 12 10.18	!	S	9.7	AA	20	L	6	55					HAL
1993 12 11.10		M	9.6	AA	31.8	L	4	63	3	2			KEE
1993 12 11.86		B	10.5:	VF	12	L	6	40		3			REN
1993 12 12.06		S	9.6:	S	33.3	L	4	56	2.1	5			KRO02
1993 12 12.45		S	9.5	NP	15.0	R	5	25	5	4			NAG02
1993 12 12.75		S	9.7	AC	33.4	L	4	214	1	4	0.1	45	SZE02
1993 12 12.76		S	9.3	AA	8.0	B	8	40	2	5			BAR
1993 12 12.98	a	S	9.2	NP	31.7	L	6	68	2.5	5			BOR
1993 12 13.07		M	10.8	GA	35.9	L	7	85	1.0	3			MOD
1993 12 13.75		B	10.0	VF	25	L	6	75	2	3		320	REN
1993 12 13.82		B	9.5	VF	12	L	6	40	2.5				REN
1993 12 14.71		S	9.8	AC	15.2	L	5	44	3.5	4			MOE
1993 12 16.11		S	9.2	AA	20	T	10	64	3	2/			SPR
1993 12 17.02		S	9.1	NP	31.7	L	6	68	4.5	5	0.1	20	BOR
1993 12 17.10		S	9.0	AA	20	T	10	64	3.0	2/			SPR
1993 12 18.00		S	9.2	NP	31.7	L	6	68	3.4	5	?	20	BOR
1993 12 18.80		S	9.6	AC	44.5	L	4	146	2	5	0.15	60	BAK01
1993 12 18.80		S	9.7	AC	44.5	L	4	146	1.5	6	0.1	60	SAR02
1993 12 19.79		S	10.1	AC	15.2	L	5	44	3	3			MOE
1993 12 21.77		S	10.4	S	11	L	8	54	1.5	4			KYS
1993 12 22.01		S	10.5:	HS	33.3	L	4	122	1.5	4			KRO02
1993 12 23.70		S	10.6	S	11	L	8	54	1.2	3			KYS
1993 12 30.71		C	11.4	HS	30	T	5						RAA01
1993 12 31.69		S	10.1	S	11	L	8	54	1.5	3/			KYS
1994 01 02.74		S	9.3	AA	15	R	15	85	2.5	2			DIE02
1994 01 03.78		S	10.7	AC	33.4	L	4	214	1.2	4	0.13	50	SZE02
1994 01 04.13	!	S	10.2	AA	20	L	6	55					HAL
1994 01 04.74		S	9.0	BD	15.2	L	8	49	5.0	3			GRA04
1994 01 05.71		M	10.5	HS	10.0	B		25	2.5	2	0.2		ZNO
1994 01 05.72		B	9.0	HS	10.0	B		25	4.5				FAB
1994 01 05.75		B	10.6	AC	33.4	L	4	214	1	6	0.05	40	SZE02
1994 01 05.75		S	10.7	AC	33.4	L	4	214	1	5	0.07	50	SAR02
1994 01 05.81		S	9.6	S	10.0	B		25					HUD02
1994 01 06.73		S	9.2	BD	15.2	L	8	49	4.3	4			GRA04
1994 01 06.77		B	10.5	VF	12	L	6	40	2.5	5/			REN
1994 01 07.72		S	11.4	AC	33.4	L	4	214	1	4	0.07	65	SZE02
1994 01 08.72		I	10.3	S	11	L	8	32	2	2			KYS
1994 01 10.13	!	M	10.1	AA	41	L	4	83					HAL
1994 01 10.77		B	10.6	VF	12	L	6	40	2	5			REN
1994 01 12.06		M	9.4	AA	31.8	L	4	33	6	1			KEE
1994 01 12.72		C	11.3	HS	30	T	5						RAA01
1994 01 12.72		M	10.3	S	10.0	B		25	2	4			ZNO
1994 01 12.73		S	11.4	AC	33.4	L	4	214	1.2	3			SZE02

Comet Mueller 1993a [cont.]

DATE (UT)		MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 01 12.73		S	11.6	AC	33.4	L	4	214	1	4			SAR02
1994 01 14.76		M	9.9	S	10.0	B		25	3	3	0.1		ZNO
1994 01 14.77		B[	10.8	VF	12	L	6	40					REN
1994 01 15.12	!	S	10.0:	AA	20	L	6	55					HAL
1994 01 15.72		S	11.5	AC	33.4	L	4	214	0.8	3	0.01	40	SZE02
1994 01 15.74		C	11.2	HS	30	T	5						RAA01
1994 01 19.74		S	11.1	AC	33.4	L	4	214	0.7	3			SAR02
1994 01 19.74		S	11.3	AC	33.4	L	4	214	0.8	3	0.02	75	SZE02

Comet Shoemaker-Levy 1993h

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 06 10.19	I[	13.0:		41	L	4	183					HAL

Comet Mueller 1993p

DATE (UT)		MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 08 20.61		C	14.4	GA	60.0	Y	6		0.4			290	NAK01
1993 08 24.64		S	13.8	GA	60.0	Y	8	240	0.6	6			NAK01
1993 08 24.66		C	14.7	GA	60.0	Y	6		0.4		0.05	280	NAK01
1993 08 25.56	a	C	14.5	GA	60.0	Y	6		0.4		0.03	280	NAK01
1993 08 26.73		C	14.5	HS	20	L	5		0.18		0.01	285	ITO02
1993 08 27.65		S	13.9	GA	60.0	Y	8	192	0.7	6			NAK01
1993 09 07.82		B	13.6	HS	25	L	15	140	0.8	7			STE10
1993 09 08.14		M	14.0	GA	35.9	L	7	164	0.4	4			MOD
1993 09 09.82		B	13.3	HS	25	L	15	140	0.5	7			STE10
1993 09 12.16		M	14.0	GA	35.9	L	7	164	0.4	4			MOD
1993 09 13.88		S	13.8	AC	33.4	L	4	214	0.8	3			SZE02
1993 09 18.91		S	13.2	AC	30.5	L	5	325	1.5	4			VIC
1993 09 20.80	!	C	13.2	L	18	L	6		1.3		0.04	308	PRA01
1993 09 20.86		S	13.1	AC	33.4	L	4	214	2	1			SZE02
1993 09 23.08		S	12.9	AC	33.4	L	4	214	1.5	3			SZE02
1993 09 24.26		S[	14.3	GA	35.9	L	7	164	! 0.5				MOD
1993 09 25.65		C	13.4	HS	20	L	5		0.65		0.02	295	ITO02
1993 09 25.69		C	13.1	GA	60.0	Y	6		0.8			320	NAK01
1993 10 06.06		M	13.4	GA	35.9	L	7	164	0.5	2			MOD
1993 10 07.05		S	11.9	GA	20	L	8	130	2	1/			DID
1993 10 07.10		M	12.3	GA	35.9	L	7	85	0.9	2/			MOD
1993 10 07.10		M	12.6	GA	35.9	L	7	164	0.8	2/			MOD
1993 10 07.80		C	13.0	HS	18	L	6		> 0.5		0.03	350	PRA01
1993 10 08.02		S	11.9	GA	20	L	8	130	2	1/			DID
1993 10 08.06		M	12.5	GA	35.9	L	7	85	0.6	2/			MOD
1993 10 08.86		B	12.0	HS	31	L		120	1.5	4			STE10
1993 10 09.86		S	12.8	AC	33.4	L	4	214	1	4			SZE02
1993 10 09.90		B	12.4	VF	25	L	6	75	2	4			REN
1993 10 09.93		S	12.8	AC	30.5	L	5	325	2	7			VIC
1993 10 11.04		S	11.7	GA	20	L	8	130	3	1/			DID
1993 10 11.12		M	12.6	GA	35.9	L	7	85	0.6	3/			MOD
1993 10 11.65		C	12.5	GA	60.0	Y	6		1.3		0.08	355	NAK01
1993 10 13.79		I	12.3:	HS	10.0	B		25	0.8				ZNO
1993 10 14.00		S	11.6	GA	20	L	8	130	3	1/			DID
1993 10 14.17		M	12.5	GA	35.9	L	7	85	0.7	4	0.02	355	MOD
1993 10 15.15		B	12.1:	HS	33.3	L	4	216	1.4	3			KRO02
1993 10 15.85		S	11.8	AC	15.2	L	5	76	1.5	2			MOE
1993 10 16.00		S	12.3	AC	20.3	T	10	80	0.6	4			GAR02
1993 10 16.80		S	11.8	AC	15.2	L	5	76	1.5	2			MOE
1993 10 16.83		S	12.8	AC	44.5	L	4	286	0.8	4			SZE02
1993 10 16.84		S	12.6	AC	44.5	L	4	286	0.8	4			SAR02
1993 10 17.78		S	11.8	AC	15.2	L	5	76	1.5	1			MOE

Comet Mueller 1993p [cont.]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 10 17.86	S	11.7	A	30.0	L	5	60	& 2	1			SCH04
1993 10 18.78	S	11.6	AC	15.2	L	5	76	1.5	2			MOE
1993 10 18.84	S	11.8	A	30.0	L	5	60	& 2	1			SCH04
1993 10 18.90	S	11.6	AC	15.2	L	5	44	1.5	2			MOE
1993 10 19.03	S	11.6	AC	31.7	L	6	88	1.2	2			BOR
1993 10 19.10	! C	12.6	L	18	L	6		1.5		0.06	14	PRA01
1993 10 19.77	S	11.7	AC	15.2	L	5	76	1.5	1			MOE
1993 10 19.88	S	11.5	HS	20.3	T	10	154	1.5	2			LUE
1993 10 20.97	S	11.5	GA	20	L	8	130	3	1/			DID
1993 10 22.06	B	11.9	VF	25	L	6	75	2	4			REN
1993 10 23.28	S	11.7	AC	31.7	L	6	88	1.8				BOR
1993 10 23.34	M	12.4	GA	35.9	L	7	85	0.8	2/			MOD
1993 10 24.32	M	12.6	GA	35.9	L	7	85	0.7	3			MOD
1993 10 25.34	M	12.9	GA	35.9	L	7	85	0.7	2/			MOD
1993 10 25.41	! S	12.4	AA	41	L	4	83					HAL
1993 10 26.04	S	11.8	AC	33.4	L	4	214	1	1			SAR02
1993 10 26.04	S	11.9	AC	33.4	L	4	214	1	3			SZE02
1993 11 03.76	S	11.5:	AC	13.0	L	6	36	2.5	1			MEY
1993 11 04.01	M	12.8	GA	35.9	L	7	85	0.8	2			MOD
1993 11 04.75	S	11.4	GA	13.0	L	6	36	2	1			MEY
1993 11 06.21	M	12.1	AA	41	L	4	83					HAL
1993 11 07.02	S	11.2:	S	28	T	10	140	3	0			WAR
1993 11 07.75	S	12.2	AC	33.4	L	4	214	1	4			SZE02
1993 11 08.03	S	11.6	AC	31.7	L	6	88	1.5	2			BOR
1993 11 09.00	S	11.5	GA	20	L	8	130	4	0/			DID
1993 11 09.07	S	11.6	AC	31.7	L	6	88	1.8	2			BOR
1993 11 09.22	M	13.0	GA	35.9	L	7	85	0.75	2			MOD
1993 11 10.18	M	13.0	GA	35.9	L	7	85	0.9	3			MOD
1993 11 11.00	S	12.5	VF	25	L	6	75	2.5	2			REN
1993 11 11.02	S	11.7	AC	31.7	L	6	88	1.3				BOR
1993 11 11.14	S	11.3	AA	20	T	10	125	2	2			SPR
1993 11 12.26	S	11.5	AA	20	T	10	125	2	1			SPR
1993 11 12.75	S	10.9:	AC	15.2	L	5	76	1.5	1			MOE
1993 11 13.08	S	11.7	AC	31.7	L	6	68	2.0	0			BOR
1993 11 13.15	S	11.0	AA	20	T	10	64	2	2			SPR
1993 11 13.75	S	11.3:	GA	13.0	L	6	36	3	1/			MEY
1993 11 14.16	S	11.1	AA	20	T	10	64	2	2/			SPR
1993 11 14.87	S	10.9	HS	11	L	8	54	2	1			KYS
1993 11 14.96	S	12.7	VF	25	L	6	75	1	3/			REN
1993 11 16.06	S	10.8	GA	20	L	8	130	5	1/			DID
1993 11 16.15	S	10.9	AA	20	T	10	125	4	3			SPR
1993 11 16.85	! V	12.1	YF	20.0	T	2		& 1	9	&0.13	030	MIK
1993 11 16.87	S	11.2	AC	15.2	L	5	76	1.5	0			MOE
1993 11 17.02	S	11.7	AC	31.7	L	6	68	1.8	2			BOR
1993 11 17.19	S	10.8	AA	20	T	10	64	2	3/			SPR
1993 11 17.73	S	11.6	AC	15.2	L	5	76	2	1			MOE
1993 11 17.89	S	11.4	AC	15.2	L	5	44	2	1			MOE
1993 11 18.12	S	10.8	AA	20	T	10	125	3	3/			SPR
1993 11 18.21	S	12.7	AC	31.8	L	4	150	1	1			KEE
1993 11 18.80	S	12.4	AC	33.4	L	4	214	0.75	4			SZE02
1993 11 18.80	S	12.6	AC	33.4	L	4	214	0.7	3			SAR02
1993 11 18.84	S	11.4	AC	15.2	L	5	76	2	1			MOE
1993 11 18.88	C	12.8	L	65	L	4		1.3		>0.09	29	PRA01
1993 11 18.88	c	14.8	L	65	L	4		1.3		>0.09	29	PRA01
1993 11 19.13	M	12.9:	GA	35.9	L	7	85	0.7	2			MOD
1993 12 03.79	! V	12.4	YF	20.0	T	2		& 1	9	&0.17	035	MIK
1993 12 04.12	S	12.0	AA	20	L	6	110					HAL
1993 12 05.73	S	10.9	HS	11	L	8	54	1.5	2			KYS
1993 12 07.04	B	11.4:	HS	33.3	L	4	122	1.6	3			KRO02

Comet Mueller 1993p [cont.]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 12 07.44	C	13.0	GA	60.0	Y	6		0.85		>0.11	35	NAK01
1993 12 08.03	B	11.8:	HS	33.3	L	4	201	1.1	3			KRO02
1993 12 08.41	S	12.2	AC	20	L	6	106	1.0	4/			NAK01
1993 12 08.70	S	12.5	AC	33.4	L	4	214	0.6	4			SZE02
1993 12 09.04	B	11.8	HS	33.3	L	4	122	1.2	3			KRO02
1993 12 10.16	S	12.0	AA	20	L	6	110					HAL
1993 12 11.08	M	11.0	AC	31.8	L	4	63	2.5	2			KEE
1993 12 11.79	B	12.0	VF	25	L	6	75	1	3/			REN
1993 12 12.05	S	11.6	HS	33.3	L	4	122	1.1	3			KRO02
1993 12 13.06	M	12.9:	GA	35.9	L	7	85	0.6	2			MOD
1993 12 13.98	S	10.8	AC	31.7	L	6	68	2.5	2			BOR
1993 12 14.72	S	10.6	AC	15.2	L	5	76	2.5	3			MOE
1993 12 15.12	M	12.0:	AA	41	L	4	83					HAL
1993 12 16.98	S	10.8	AC	31.7	L	6	68	2.3	1			BOR
1993 12 30.70	C	12.7	HS	30	T	5						RAA01
1993 12 31.70	S	11.4	HS	11	L	8	32	1.2	2			KYS
1994 01 04.10	M	11.0	AA	20	L	6	55					HAL
1994 01 05.70	M	10.2	HS	10.0	B		25	4				FAB
1994 01 05.70	M	10.4	HS	10.0	B		25	2.5	3	0.15		ZNO
1994 01 05.71	B	11.6	AC	33.4	L	4	214	0.8	7	0.02	20	SAR02
1994 01 05.71	B	11.9	AC	33.4	L	4	214	0.8	8	0.01	7	SZE02
1994 01 07.71	S	11.9	AC	33.4	L	4	214	0.8	5			SZE02
1994 01 10.11 !	M	10.9	AA	41	L	4	83			0.25	43	HAL
1994 01 11.11	M	10.0	AA	31.8	L	4	63	2	1			KEE
1994 01 12.70	C	12.1	HS	30	T	5						RAA01
1994 01 12.70	M	10.4	HS	10.0	B		25	2	3			ZNO
1994 01 12.71	S	11.8	AC	33.4	L	4	214	0.8	3	0.02	45	SAR02
1994 01 12.71	S	12.0	AC	33.4	L	4	214	1	4	0.03	60	SZE02
1994 01 15.75	C	11.9	HS	30	T	5						RAA01
1994 01 19.71	S	11.8	AC	33.4	L	4	214	0.6	1			SAR02
1994 01 19.71	S	12.1	AC	33.4	L	4	214	0.7	1			SZE02
1994 01 22.10		9.8:		31.8	L	4	150	1	1			KEE

Periodic Comet Encke

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 10 07.12	S[	13.1	GA	35.9	L	7	85	! 1.0				MOD
1993 10 08.12	S[	13.3	GA	35.9	L	7	85	! 1.0				MOD
1993 10 14.20	S[	13.4	GA	35.9	L	7	85	! 1.0				MOD
1993 10 23.24	S[	13.3	GA	35.9	L	7	85	! 1.0				MOD
1993 11 04.03	S[	12.8	GA	35.9	L	7	85	! 1.0				MOD
1993 11 09.15	S[	13.4	GA	35.9	L	7	85	! 1.0				MOD
1993 11 10.14	S[	13.4	GA	35.9	L	7	85	! 1.0				MOD
1993 11 16.84 !	V	14.6	YF	20.0	T	2		& 4	2			MIK
1993 11 18.81	C	17.3	L	65	L	4		+ 0.45				PRA01
1993 11 18.81	c	18.0	L	65	L	4		4.0				PRA01
1993 11 19.12	S[	13.4	GA	35.9	L	7	85	! 1.0				MOD
1993 12 03.82 !	V	13.2	AA	20.0	T	2		& 5	2			MIK
1993 12 04.15	I[	12.0:		20	L	6	110					HAL
1993 12 07.03	S	13.0:	HS	33.3	L	4	201	1.0	2			KRO02
1993 12 08.02	S	13.1:	HS	33.3	L	4	201	1.1	2			KRO02
1993 12 08.10	c	19.2	FA	91.4	L	5						SCO01
1993 12 08.76	S	14 :	AC	33.4	L	4	214	0.25	1			SZE02
1993 12 09.03	S	13.0:	HS	33.3	L	4	201	0.9	2			KRO02
1993 12 10.13	I[	12.0:		20	L	6	110					HAL
1993 12 11.07	M	10.7	AC	31.8	L	4	48	5	1			KEE
1993 12 12.03	S	12.7	HS	33.3	L	4	201	0.9	2			KRO02
1993 12 12.75	S	13.8	AC	33.4	L	4	214	0.25	1			SZE02
1993 12 12.97	S	11.5	AC	31.7	L	6	68	2.5	0			BOR

Periodic Comet Encke [cont.]

DATE (UT)		MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 12	13.05	S	12.8	GA	35.9	L	7	85	1.2	0			MOD
1993 12	13.97	S	11.3	AC	31.7	L	6	68	3	0			BOR
1993 12	14.72	S	11.2:	AC	15.2	L	5	76	2.5	1			MOE
1993 12	15.10	S	11.5	AA	41	L	4	83					HAL
1993 12	16.97	S	11.1	AC	31.7	L	6	68	3	0			BOR
1993 12	30.97	S	9.5	AC	31.7	L	6	68	3.3	2			BOR
1993 12	31.97	S	9.4	AC	31.7	L	6	68	3.3	2/			BOR
1994 01	04.11	S	10.3	AA	20	L	6	55					HAL
1994 01	04.69	S	9.4	AC	15.2	L	8	49	3.0	3/			GRA04
1994 01	05.09	c	18.7	FA	91.4	L	5						SCO01
1994 01	05.70	M	10.6	HS	10.0	B		25	2	4			ZNO
1994 01	05.73	S	10.2	AC	33.4	L	4	214	1.5	1	0.02	290	SZE02
1994 01	05.73	S	10.2	AC	33.4	L	4	214	2	1			SAR02
1994 01	05.74	M	11.4	HS	10.0	B		25	3				FAB
1994 01	06 12	S	9.6	AA	20	T	10	64	4.5	4			SPR
1994 01	06.71	S	9.1	AC	15.2	L	8	49	4.3	3/			GRA04
1994 01	07.72	S	10.1	AC	33.4	L	4	214	2	1			SZE02
1994 01	07.75	S	9.4	AA	10.0	B		25	3.3	3			HAS02
1994 01	08.69	S	9.0	AC	15.2	L	8	49	4.5	3			GRA04
1994 01	10.12	! M	9.5	AA	41	L	4	83					HAL
1994 01	11.09	M	8.8	AA	31.8	L	4	33	5	2			KEE
1994 01	12.08	M	8.8	AA	31.8	L	4	33	5	3			KEE
1994 01	12.71	M	9.9	S	10.0	B		25	2	3			ZNO
1994 01	12.72	B	9.5	AC	33.4	L	4	61	1.2	3	0.02	260	SAR02
1994 01	12.72	B	9.5	AC	33.4	L	4	61	1.5	2	0.02	250	SZE02
1994 01	13.74	S	8.3	AA	11.4	L	8	45	6	3			FOG
1994 01	14.08	M	8.7	AA	7.6	L	10	30	5	2			KEE
1994 01	14.73	S	8.7	AA	10.0	B		25	2.6	4			HAS02
1994 01	14.74	M	10.2	S	10.0	B		25	1.5	3			ZNO
1994 01	15.05	S	8.5	S	33.3	L	4	56	& 3.0	4			KRO02
1994 01	15.06	M	8.6	AA	7.6	L	10	30	5	2			KEE
1994 01	15.10	! S	8.5	NP	5	B		10					HAL
1994 01	15.72	C	11.7	HS	30	T	5						RAA01
1994 01	15.76	S	9.2	AC	33.4	L	4	214	1.2	2	0.03	250	SZE02
1994 01	16.02	S	8.4	S	33.3	L	4	56	2.7	5			KRO02
1994 01	18.12	S	7.8	AA	20	T	10	64	4.5	4			SPR
1994 01	19.72	B	8.6	AC	33.4	L	4	214	1.2	3	0.04	250	SZE02
1994 01	19.72	S	8.4	AC	33.4	L	4	214	1	4	0.03	245	SAR02
1994 01	19.73	S	8.1	AA	10.0	B		25	3.0	4			HAS02
1994 01	20.09	M	8.0	S	7.6	L	10	30	5	3			KEE
1994 01	20.10	S	7.2	AA	20	T	10	64	4.5	5			SPR
1994 01	22.05	B	7.7	S	33.3	L	4	56					KRO02
1994 01	22.05	S	7.3	S	8.0	B		20	3	6			KRO02
1994 01	22.05	S	7.5	S	33.3	L	4	56	& 2.0	6			KRO02
1994 01	22.07	M	7.8	S	7.6	L	10	30	5	3			KEE
1994 01	24.09	S	7.4	AA	20	T	10	64	4.0	5			SPR
1994 01	25.07	M	7.5	S	7.6	L	10	30	4	3			KEE
1994 01	27.07	M	7.4	SC	20	L	6	55					HAL

Periodic Comet Kojima (1992z)

DATE (UT)		MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 12	09.46	C	19.8	FA	91.4	L	5						SCO01
1993 12	09.47	C	19.2	FA	91.4	L	5						SCO01
1993 12	09.48	C	19.0	FA	91.4	L	5						SCO01
1994 01	07.44	c	20.9	FA	91.4	L	5		0.20		<0.01	297	SCO01
1994 01	07.48	C	18.9	FA	91.4	L	5						SCO01
1994 01	07.52	C	18.6	FA	91.4	L	5						SCO01

Periodic Comet Spitaler (1993r)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 12 19.09	C	18.3	FA	91.4	L	5						SCO01
1994 01 05.15	c	21.5	FA	91.4	L	5						SCO01
1994 01 05.16	C	18.5	FA	91.4	L	5		0.15		<0.01	87	SCO01

Periodic Comet Holmes (1993i)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 07 22.74	C	16.9	GA	60.0	Y	6		0.25				NAK01
1993 08 24.74	C	17.4	GA	60.0	Y	6		0.25			255	NAK01
1993 09 26.77	C	17.7	GA	60.0	Y	6		0.2				NAK01
1993 10 11.68	C	18.1	GA	60.0	Y	6		0.15				NAK01
1993 10 19.68	C	17.7	GA	60.0	Y	6		0.2			245	NAK01

Periodic Comet Schwassmann-Wachmann 2

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 08 22.39	S[	12.8	GA	35.9	L	7	164	! 0.5				MOD
1993 08 26.39	S[	13.3	GA	35.9	L	7	164	! 0.5				MOD
1993 09 20.14	! C	15.5	L	18	L	6		0.4				PRA01
1993 09 24.39	S[	14.5	GA	35.9	L	7	164	! 0.5				MOD
1993 10 11.35	S[	14.2	GA	35.9	L	7	164	! 0.5				MOD
1993 10 14.38	M	14.5	GA	45.7	L	4	176	0.35	2/			MOD
1993 10 23.41	S[	14.4	GA	35.9	L	7	164	! 0.5				MOD
1993 10 24.42	S	14.6	GA	35.9	L	7	164	0.40	2			MOD
1993 10 25.47	I[	13.5:		41	L	4	183					HAL
1993 11 09.35	M	14.0	GA	35.9	L	7	164	0.50	2			MOD
1993 11 10.41	M	14.2	GA	35.9	L	7	164	0.50	2/			MOD
1993 11 20.14	C	13.8	L	65	L	4		0.75		>0.13	282	PRA01
1993 11 20.14	c	15.3	L	65	L	4						PRA01
1993 11 29.31	B	12.3:	HS	33.3	L	4	201	0.7	2			KRO02
1993 12 07.21	S	12.5:	HS	33.3	L	4	201	0.7	2			KRO02
1993 12 08.20	S	12.5:	HS	33.3	L	4	201	0.6	3			KRO02
1993 12 09.20	S	12.6	HS	33.3	L	4	201	0.8	3			KRO02
1993 12 12.04	S	13.2	AC	44.5	L	4	250	& 1.5	3			SAR02
1993 12 12.04	S	13.4	AC	44.5	L	4	250	& 1.2	2			BAK01
1993 12 12.15	! V	12.9	YF	20.0	T	2		& 1	8	&0.13	300	MIK
1993 12 12.23	S	12.4	HS	33.3	L	4	201	0.6	3			KRO02
1993 12 15.24	S	12.6	CA	41	L	4	83					HAL
1993 12 17.94	! V	12.5	AA	20.0	T	2		0.7	8	&0.25	280	MIK
1993 12 19.04	S	12.0	AC	44.5	L	4	146	1	4			BAK01
1993 12 19.04	S	12.5	AC	44.5	L	4	146	1	4			SAR02
1994 01 03.84	S	12.0	AC	33.4	L	4	214	0.7	2			SZE02
1994 01 04.23	S	12.1	WA	20	L	6	110					HAL
1994 01 05.84	S	12.1	AC	33.4	L	4	214	0.75	3			SZE02
1994 01 05.84	S	12.2	AC	33.4	L	4	214	0.5	3			SAR02
1994 01 07.77	S	12.1	AC	33.4	L	4	214	0.6	3			SZE02
1994 01 09.19	S	11.7	CA	41	L	4	83					HAL
1994 01 11.25	M	11.7	AC	31.8	L	4	63	1.7	3			KEE
1994 01 12.83	S	12.1	AC	33.4	L	4	214	0.8	2			SAR02
1994 01 12.83	S	12.4	AC	33.4	L	4	214	0.7	3			SZE02
1994 01 14.82	I	11.9	HS	10.0	B		25	1	5			ZNO
1994 01 15.79	S	12.1	AC	33.4	L	4	214	0.7	4			SZE02
1994 01 15.81	S	12.1	AC	44.5	L	4	230	1	7	0.03	290	SAR02
1994 01 16.23	S	11.6	HS	33.3	L	4	201	0.6	4			KRO02
1994 01 16.39	c	17.3	FA	91.4	L	5		2.03		&0.42	281	SCO01
1994 01 16.43	C	12 :	FA	91.4	L	5						SCO01
1994 01 16.95	S	10.0	AA	15	R	15	85	2	8			DIE02
1994 01 17.18	S	10.9	AA	20	T	10	125	2.0	2			SPR
1994 01 19.82	S	12.2	AC	33.4	L	4	214	0.5	3	0.01	280	SZE02

Periodic Comet Schwassmann-Wachmann 2 [cont.]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 01 19.82		S 12.3	AC	33.4	L	4	214	0.6	5			SAR02
1994 01 19.83		S 12.3	AC	44.5	L	4	134	1	7	0.02	300	KIS02
1994 01 20.16		S 11.3	AA	20	T	10	125	2.0	2			SPR
1994 01 23.17	!	V 11.5	AA	20.0	T	2		& 2	8	&0.2	275	MIK
1994 01 30.15		S 10.6	AA	20	T	10	64	2.0	3			SPR
1994 01 31.13		S 10.4	AA	20	T	10	64	2.0	3/			SPR

Periodic Comet Forbes (1993f)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 06 19.44		I[12.5:		41	L	4	183					HAL
1993 10 24.19		c 19.5	FA	91.4	L	5		0.40		0.04	242	SCO01
1993 10 24.21		C 16.7	FA	91.4	L	5						SCO01
1993 12 10.17		C 17.7	FA	91.4	L	5		0.27		<0.01	81	SCO01
1993 12 10.17		c 20.4	FA	91.4	L	5						SCO01
1994 01 07.12		c 22.2	FA	91.4	L	5		0.27		<0.01	65	SCO01
1994 01 07.13		C 19.0	FA	91.4	L	5						SCO01

Periodic Comet Gunn

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 12 08.40		c 20.3	FA	91.4	L	5						SCO01
1994 01 14.20		C 17.7	FA	91.4	L	5						SCO01
1994 01 14.23		C 17.9	FA	91.4	L	5						SCO01
1994 01 14.25		c 20.9	FA	91.4	L	5		0.23		&0.02	267	SCO01

Periodic Comet West-Kohoutek-Ikemura (1993o)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 08 24.77	a	C 18.2	GA	60.0	Y	6		0.2				NAK01
1993 08 27.78	a	C 17.8	GA	60.0	Y	6		0.2				NAK01
1993 09 26.78	a	C 17.1	GA	60.0	Y	6		0.25			250	NAK01
1993 10 11.39		S[14.0	GA	35.9	L	7	164	! 0.5				MOD
1993 10 11.74		C 16.4	GA	60.0	Y	6		0.3			265	NAK01
1993 10 14.41		S[14.2	GA	45.7	L	4	176	! 0.5				MOD
1993 10 22.50		C 15.6	FA	91.4	L	5						SCO01
1993 10 22.51		c 19.4	FA	91.4	L	5		0.40		&0.03	273	SCO01
1993 10 22.76		C 15.9	GA	60.0	Y	6		0.4		0.04	265	NAK01
1993 10 23.42		S[13.8	GA	35.9	L	7	164	! 0.5				MOD
1993 10 24.43		S[14.1	GA	35.9	L	7	164	! 0.5				MOD
1993 10 25.45		I[13.5:		41	L	4	183					HAL
1993 11 09.38		S[14.1	GA	35.9	L	7	164	! 0.5				MOD
1993 11 10.38		S[14.2	GA	35.9	L	7	164	! 0.5				MOD
1993 11 14.75		C 14.8	GA	60.0	Y	6		0.55			290	NAK01
1993 11 16.99	!	V 14.4	YF	20.0	T	2		1.5	7			MIK
1993 11 18.68		C 14.6	GA	60.0	Y	6		0.6			290	NAK01
1993 11 19.06		C 14.7	L	65	L	4		+ 0.8		0.03	289	PRA01
1993 11 19.06		c 16.1	L	65	L	4		1.8		0.03	289	PRA01
1993 11 19.19		S[13.0	GA	35.9	L	7	164	! 0.5				MOD
1993 11 20.04		C 14.6	L	65	L	4		0.6		0.02	293	PRA01
1993 11 20.04		c 16.0	L	65	L	4						PRA01
1993 12 04.17		I[12.5:		20	L	6	110					HAL
1993 12 07.22		S 12.6:	HS	33.3	L	4	201	0.4	2			KRO02
1993 12 08.18		S 12.9:	HS	33.3	L	4	201	0.6	2			KRO02
1993 12 09.22		S 12.8:	HS	33.3	L	4	201	0.6	2			KRO02
1993 12 12.20		S 12.9	HS	33.3	L	4	201	0.7	2			KRO02
1993 12 12.49		C 13.6	GA	60.0	Y	6		1.1			240	NAK01
1993 12 13.23		M 13.9	GA	35.9	L	7	164	0.45	1/			MOD
1993 12 15.17		S 12.5	AA	41	L	4	83					HAL

Periodic Comet West-Kohoutek-Ikemura (1993o) [cont.]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 12 17.82	! V	13.2	YF	20.0	T	2		0.5	9			MIK
1993 12 18.99	S	13.5:	AC	44.5	L	4	252	1.5	1			SAR02
1994 01 05.83	S	13.8:	AC	33.4	L	4	214	0.7	0			SAR02
1994 01 05.83	S	14.1:	AC	33.4	L	4	214	0.8	2			SZE02
1994 01 07.74	S	13.9	AC	33.4	L	4	214	0.8	1			SZE02
1994 01 10.22	S	13.2	WA	41	L	4	183					HAL
1994 01 15.92	S	13.8	AC	44.5	L	4	230	0.5	4			SAR02
1994 01 15.97	! V	13.8	YF	20.0	T	2		1.5	3			MIK
1994 01 16.21	S	13.0	HS	33.3	L	4	201	0.6	3			KRO02
1994 01 19.92	S	13.8	AC	44.5	L	4	230	0.5	1			KIS02
1994 01 29.78	! V	14.9	YF	20.0	T	2		& 1.5	2			MIK

Periodic Comet Howell (1992c)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 06 24.34	S[	13.0	GA	35.9	L	7	164	! 0.5				MOD
1993 06 30.34	S[	13.0	GA	35.9	L	7	164	! 0.5				MOD
1993 07 22.75	C	15.0	GA	60.0	Y	6		0.4			240	NAK01
1993 07 25.44	S[	13.2	AA	41	L	4	183	1				HAL
1993 10 19.12	! C	16.0	L	18	L	6		0.3		0.05	240	PRA01
1993 10 20.44	c	20.2	FA	91.4	L	5		0.65		0.23	251	SCO01
1994 01 07.14	c	21.4	FA	91.4	L	5		0.43		>0.02	238	SCO01
1994 01 07.15	C	17.7	FA	91.4	L	5						SCO01

Periodic Comet Urata-Niijima (1993q)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 10 20.49	C	19.4	FA	91.4	L	5		0.18		<0.01	290	SCO01
1993 10 21.49	c	22.7	FA	91.4	L	5						SCO01
1993 10 21.50	C	19.6	FA	91.4	L	5		0.25		<0.01	292	SCO01
1993 12 10.48	c	23.0	FA	91.4	L	5		0.13		<0.01	312	SCO01
1993 12 10.50	C	20.8	FA	91.4	L	5						SCO01
1994 01 07.53	C	21.9	FA	91.4	L	5						SCO01
1994 01 07.54	C	21.2	FA	91.4	L	5				<0.01	304	SCO01

Periodic Comet Hartley 3 (1993m)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 09 25.78	C	16.4	GA	60.0	Y	6		0.25			245	NAK01
1993 09 26.75	C	16.6	GA	60.0	Y	6		0.25			245	NAK01
1993 10 11.66	C	15.7	GA	60.0	Y	6		0.35			235	NAK01
1993 10 19.63	C	15.5	GA	60.0	Y	6		0.35		0.03	240	NAK01
1993 10 20.45	C	15.1	FA	91.4	L	5		0.37		&0.02	234	SCO01
1993 11 14.71	C	14.7	GA	60.0	Y	6		0.55				NAK01
1993 11 18.64	C	14.7	GA	60.0	Y	6		0.55				NAK01
1993 12 12.46	C	14.9	GA	60.0	Y	6		0.5			105	NAK01
1993 12 15.51	C	14.8	GA	60.0	Y	6		0.5			105	NAK01
1993 12 17.80	! V	14.5	AA	20.0	T	2		0.3	8	&0.04	230	MIK
1994 01 06.20	C	18.2	FA	91.4	L	5						SCO01
1994 01 29.76	! V	15.0	AA	20.0	T	2		& 1	3			MIK

Periodic Comet Kushida-Muramatsu (1993t)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 12 12.81	C	15.7	HS	65	L	4		0.4		0.01	270	PRA01

Periodic Comet Ashbrook-Jackson (1992j)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 05 22.37		S[10.5	GA	35.9	L	7	164	! 0.5				MOD
1993 06 16.34		S[12.5	GA	35.9	L	7	164	! 0.5				MOD
1993 06 17.34		S[13.6	GA	35.9	L	7	164	! 0.5				MOD
1993 06 24.33		S[13.8	GA	35.9	L	7	164	! 0.5				MOD
1993 06 30.33		S[13.7	GA	35.9	L	7	164	! 0.5				MOD
1993 07 17.33		S 13.2	GA	20.0	L	5	68	1.0	1			MOD
1993 07 21.45		S 12.7	AA	41	L	4	183					HAL
1993 07 22.34		S 13.7	GA	35.9	L	7	85	0.6	3			MOD
1993 07 22.77		S 13.4	GA	60.0	Y	8	240	0.5	4			NAK01
1993 07 25.42		S 12.7	AA	41	L	4	183					HAL
1993 08 14.33		S[13.7	GA	35.9	L	7	164	! 0.5				MOD
1993 08 16.04		B 13.5	VF	50	L	4	77		3/			REN
1993 08 17.01		S 12.5	A	20.0	T	10	76	> 3	0			COM
1993 08 18.04		S 12.4	A	20.0	T	10	76	> 2	0			COM
1993 08 19.05		B 13.2	VF	50	L	4	77	0.4	4/	0.04	240	REN
1993 08 21.41		S 12.5	AA	20	L	6	122					HAL
1993 08 22.36		M 13.8	GA	35.9	L	7	164	0.5	5			MOD
1993 08 26.34		M 13.9	GA	35.9	L	7	164	0.6	3			MOD
1993 08 26.35		M 13.7	GA	35.9	L	7	85	0.7	3			MOD
1993 09 13.90		S 13.2	AC	33.4	L	4	214	1	1			SZE02
1993 09 15.40		S 12.4	AA	20	L	6	110					HAL
1993 09 15.82		B 12.7	HS	25	L	15	140	2	8			STE10
1993 09 18.90		S 12.5	AC	30.5	L	5	85	2	4			VIC
1993 09 18.91		S 11.9:	AC	15.2	L	5	76	& 2	1			MOE
1993 09 20.83		B 11.8	HS	25	L	15	140	3	7			STE10
1993 09 21.07		S 13.1	AC	33.4	L	4	214	1.5	3			SZE02
1993 09 23.06		S 13.0	AC	33.4	L	4	214	1.5	2			SZE02
1993 09 24.32		M 13.0	GA	35.9	L	7	85	1.0	4/			MOD
1993 09 26.43		S 12.5	AA	20	L	6	110					HAL
1993 10 06.08		M 13.0	GA	35.9	L	7	85	0.6	2			MOD
1993 10 06.78		B 12.0	HS	31	L		120	3	7			STE10
1993 10 07.13		M 13.3	GA	35.9	L	7	85	0.5	2			MOD
1993 10 08.11		S 13.1:	HS	33.3	L	4	216	1				KRO02
1993 10 08.88		B 12.2	HS	31	L		120	3	7			STE10
1993 10 09.90		S 13.0	AC	33.4	L	4	214	0.8	5			SZE02
1993 10 09.90		S 13.2	AC	30.5	L	5	85	2	6			VIC
1993 10 10.18		B 13.0:	HS	33.3	L	4	216	1	3			KRO02
1993 10 11.24		M 12.9	GA	35.9	L	7	85	0.55	4			MOD
1993 10 12.04		S 13.1	AC	33.4	L	4	214	0.7	3			SZE02
1993 10 14.27		M 12.8	GA	35.9	L	7	85	0.75	4			MOD
1993 10 16.05		S 12.9	AC	20.3	T	10	80	0.5	3			GAR02
1993 10 16.92		S 11.4	HS	25	L	6	60	2.5	4			KUB
1993 10 19.08	!	C 12.7	L	18	L	6		1.4		>0.26	232	PRA01
1993 10 19.85		S 12.0	HS	20.3	T	10	154	1.0	2			LUE
1993 10 23.28		M 13.3	GA	35.9	L	7	85	0.7	2			MOD
1993 10 24.18		c 17.0	FA	91.4	L	5		1.15		&0.19	234	SCO01
1993 10 24.20		C 11.0	FA	91.4	L	5						SCO01
1993 10 24.29		M 13.2	GA	35.9	L	7	85	0.8	2/			MOD
1993 10 25.33		M 13.3	GA	35.9	L	7	85	0.8	2			MOD
1993 10 25.43		S 12.6	AA	41	L	4	83					HAL
1993 11 09.25		S 13.7	GA	35.9	L	7	85	0.55	1			MOD
1993 11 10.17		S 13.7	GA	35.9	L	7	85	0.70	1			MOD
1993 12 13.16		S[14.4	GA	35.9	L	7	164	! 0.5				MOD
1994 01 05.13		c 19.2	FA	91.4	L	5						SCO01
1994 01 05.14		C 15.4	FA	91.4	L	5						SCO01

Periodic Comet Shajn-Schaldach (1993k)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 09 19.98	! C	16.4	L	18	L	6		0.25				PRA01
1993 10 11.29	S[	14.1	GA	35.9	L	7	164	! 0.5				MOD
1993 10 14.22	S[	14.2	GA	35.9	L	7	164	! 0.5				MOD
1993 10 24.15	C	16.4	FA	91.4	L	5		0.37				SCO01
1993 11 06.19	I[	13.5:		41	L	4	183					HAL
1993 12 15.20	I[	13.0:		41	L	4	183					HAL
1994 01 07.09	c	22.5	FA	91.4	L	5		0.30		0.01	56	SCO01
1994 01 07.10	C	17.9	FA	91.4	L	5						SCO01
1994 01 07.10	C	18.2	FA	91.4	L	5						SCO01

Periodic Comet Kushida (1994a)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 01 11.31	M	10.7	AC	31.8	L	4	63	2.5	2			KEE
1994 01 12.25	S	10.8	CA	20	L	6	55					HAL
1994 01 12.93	S	12.3	AC	33.4	L	4	214	0.8	2			SAR02
1994 01 12.93	S	12.4	AC	33.4	L	4	214	0.7	1			SZE02
1994 01 15.85	S	12.3	AC	33.4	L	4	214	0.8	1			SZE02
1994 01 15.94	! V	11.9	YF	20.0	T	2		& 3	7			MIK
1994 01 16.00	S	11.7	AC	44.5	L	4	230	2	3			SAR02
1994 01 16.25	S	11.1	HS	33.3	L	4	122	1.1	3			KRO02
1994 01 17.49	c	17.7	FA	91.4	L	5		9.6		&0.12	299	SCO01
1994 01 17.51	C	12 :	FA	91.4	L	5						SCO01
1994 01 19.94	S	11.6	AC	33.4	L	4	214	1.2	2			SAR02
1994 01 19.94	S	11.8	AC	33.4	L	4	214	1.5	2			SZE02
1994 01 19.99	S	11.6	AC	44.5	L	4	134	2.5	4			KIS02
1994 01 23.16	! V	10.1	YF	20.0	T	2		&15	6			MIK

Periodic Comet Schaumasse (1992x)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 02 26.15	S	9.2	A	20.0	T	10	64	4.5	2			SPR
1993 02 28.20	S	8.8	A	20.0	T	10	64	5	1			SPR
1993 03 11.22	S	9.4	A	20.0	T	10	64	4	2			SPR
1993 03 16.12	S	8.9	AA	5.6	B		8	9	1			HER02
1993 03 17.14	S	9.2	AA	5.6	B		8	9	0			HER02
1993 04 11.20	S	9.8	A	20.0	T	10	64	5	1			SPR
1993 05 08.16	S	10.8	AA	41	L	4	83					HAL
1993 05 17.22	S	11.5	AA	41	L	4	83		0/			HAL
1993 06 12.22	I[	12.5:		41	L	4	183	& 3				HAL

Periodic Comet Gehrels 3 (1992v)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 12 09.49	c	21.6	FA	91.4	L	5						SCO01
1993 12 09.50	C	19.3	FA	91.4	L	5		0.17		<0.01	292	SCO01
1994 01 16.49	c	21.6	FA	91.4	L	5		0.28		<0.01	287	SCO01
1994 01 16.50	C	18.6	FA	91.4	L	5						SCO01

Periodic Comet Halley (1986 III)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 11 15.15	B	8.4	AA	6.0	R	12	35					LOU
1985 11 16.16	B	8.5	AA	6.0	R	12	35					LOU
1985 11 18.04	B	8.7	AA	6.0	R	12	35					LOU
1985 12 06.90	B	7.3	AA	6.0	R	12	35	8				LOU
1985 12 13.05	B	6.1	AA	6.0	R	12	35	10				LOU
1986 01 09.72	B	5.6	SP	10.0	B		25	7.3				KUB
1986 03 15.47	B	3.2	AA	6.0	R	12	35	40		10		LOU

Periodic Comet Halley (1986 III) [cont.]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1986 03 18.31	B	3.8	AA	6.0	R	12	56	40		10		LOU
1986 03 26.31	B	4.1	AA	6.0	R	12	56	30		8		LOU
1986 04 10.10	B	5.0	AA	6.0	R	12	56	20				LOU
1986 04 16.07	B	5.3	AA	6.0	R	12	56	20				LOU
1986 04 22.90	B	5.2	AA	6.0	R	12	56	20				LOU
1986 04 26.90	B	5.5	AA	6.0	R	12	56	15				LOU
1986 05 05.91	B	5.8	AA	6.0	R	12	56					LOU
1986 05 08.85	B	5.6	AA	6.0	R	12	56					LOU
1986 05 15.80	B	6.1	AA	6.0	R	12	56	10				LOU
1986 05 20.90	B	6.8	AA	6.0	R	12	56					LOU
1986 05 27.90	B	7.6	AA	6.0	R	12	56					LOU
1986 06 02.85	B	7.9	AA	6.0	R	12	56					LOU

Periodic Comet Swift-Tuttle (1992 XXVIII = 1992t)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1992 10 30.69	B	5.8	SP	8.0	B	4	10	10	4			KRY01
1992 10 31.70	B	6.1	SP	8.0	B	4	10	10	4			KRY01
1992 11 12.70	S	6.0:	S	15.0	L	8	30	& 7	6			THO03
1992 11 13.68	B	5.5	SP	8.0	B	4	10	10	5			KRY01
1992 11 14.00	P	5.3	S	3.8	R							KRO02
1992 11 14.71	B	5.7	SP	8.0	B	4	10	10	4			KRY01
1992 11 15.73	S	5.5:	S	15.0	L	8	30	& 6	6			THO03
1992 11 16.02	P	5.0	S	5.1	R			& 6	7			KRO02
1992 11 16.71	S	5.3:	S	15.0	L	8	32	& 6	5			THO03
1992 11 16.72	B	5.5	SP	8.0	B	4	10	10	5			KRY01
1992 11 21.67	S	5.5:	S	36.5	L	4	51	& 6	6	&0.25	35	THO03
1992 11 22.72	S	5.5:	S	36.5	L	4	51	& 6	6	&0.2	30	THO03
1992 12 05.93	B	5.6	AA	5.0	B		7					LOU

Periodic Comet Schwassmann-Wachmann 1

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 05 10.16		I[13.0:		41	L	4	183					HAL
1993 08 21.46		I[12.0:		20	L	6	122					HAL
1993 09 15.47		I[12.5:		20	L	6	110					HAL
1993 09 24.40		S[14.4	GA	35.9	L	7	164	! 0.5				MOD
1993 09 26.48		I[12.5:		20	L	6	110					HAL
1993 10 11.36		S[14.2	GA	35.9	L	7	164	! 0.5				MOD
1993 10 11.78		C 16.9	GA	60.0	Y	6		0.2	8			NAK01
1993 10 14.40		S[14.7	GA	45.7	L	4	176	! 0.5				MOD
1993 10 16.10		S[13.3	AC	20.3	T	10	167	! 0.5				GAR02
1993 10 19.14	!	C 15.6	L	18	L	6		0.5				PRA01
1993 10 22.77		C 15.3	GA	60.0	Y	6		0.5	6			NAK01
1993 10 23.39		S[14.4	GA	35.9	L	7	164	! 0.5				MOD
1993 10 24.40		S[14.4	GA	35.9	L	7	164	! 0.5				MOD
1993 10 25.40		S[14.4	GA	35.9	L	7	164	! 0.5				MOD
1993 10 25.49		I[13.5:		41	L	4	183					HAL
1993 10 26.37		S[14.4	GA	35.9	L	7	164	! 0.5				MOD
1993 10 27.81		C 13.3	GA	60.0	Y	6		0.7	9			NAK01
1993 11 09.31		S 13.7	AC	35.9	L	7	164	0.85	1/			MOD
1993 11 10.33		S 13.7	AC	35.9	L	7	164	0.8	1			MOD
1993 11 10.35		S 13.5	AC	35.9	L	7	85	1.0	1/			MOD
1993 11 14.78		C 13.1	GA	60.0	Y	6		1.65	2			NAK01
1993 11 16.98	!	V 13.5	YF	20.0	T	2		& 2	6			MIK
1993 11 18.69		C 13.1	GA	60.0	Y	6		1.8	2			NAK01
1993 11 19.16		S[13.5	GA	35.9	L	7	164	! 0.5				MOD
1993 11 20.10		C 13.8	L	65	L	4		2.13				PRA01
1993 11 20.10		c 16.7	L	65	L	4						PRA01

Periodic Comet Schwassmann-Wachmann 1 [cont.]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 12 04.85	! V	13.2	AA	20.0	T	2		& 3.5	4			MIK
1993 12 06.02	C	13.8	HS	65	L	4		> 1.2				PRA01
1993 12 08.63	c	16.7	GA	60.0	Y	6		4.6	0			NAK01
1993 12 10.21	I[	12.0:		20	L	6	110					HAL
1993 12 11.77	c	16.5	GA	60.0	Y	6		4.7	0			NAK01
1993 12 12.13	! V	13.2	YF	20.0	T	2		& 4	2			MIK
1993 12 13.17	S[	14.1	AC	40	L	7	190	! 0.5				MOD
1993 12 15.25	I[	13.0:		41	L	4	183					HAL
1993 12 17.98	! V	14.3	YF	20.0	T	2		& 4	2			MIK
1993 12 25.81	c	16.5	HS	60.0	Y	6			0			NAK01
1994 01 03.83	S	12.8	AC	33.4	L	4	214	0.25	8			SZE02
1994 01 04.21	S	12.9	WA	20	L	6	110					HAL
1994 01 04.58	C	13.5	GA	60.0	Y	6		0.45	8/			NAK01
1994 01 05.77	S	12.7	AC	33.4	L	4	214	0.2	7			SAR02
1994 01 05.77	S	12.9	AC	33.4	L	4	214	0.2	8			SZE02
1994 01 07.75	S	12.5	AC	33.4	L	4	214	0.3	3			SZE02
1994 01 09.14	S	13.0	WA	41	L	4	83					HAL
1994 01 10.20	S	13.0	WA	41	L	4	83					HAL
1994 01 10.31	S	11.9	AC	31.8	L	4	150	1.5	1			KEE
1994 01 12.82	S	13.4	AC	33.4	L	4	214	0.3	0			SZE02
1994 01 12.82	S	13.7	AC	33.4	L	4	214	0.2	0			SAR02
1994 01 15.27	S	12.4	AC	31.8	L	4	150	1.8	0			KEE
1994 01 15.92	S	14.1	AC	44.5	L	4	230	0.2	4			SAR02
1994 01 17.18	C	13.9	FA	91.4	L	5		&15.9				SCO01
1994 01 17.20	c	18.7	FA	91.4	L	5						SCO01
1994 01 19.88	S	14.0	AC	44.5	L	4	230	& 0.5				KIS02
1994 01 23.19	! V	12.3	YF	20.0	T	2		0.7	9			MIK
1994 01 29.79	! V	13.3	YF	20.0	T	2		1.5	7			MIK

Periodic Comet Väisälä 1 (1992u)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 04 24.24	S	13.3	AA	41	L	4	183					HAL
1993 05 17.18	I[	13.5:		41	L	4	183					HAL
1993 09 05.45	C	18.0	HS	60.0	Y	6		0.2				NAK01

Periodic Comet Van Biesbroeck (1991 VI)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 10 21.40	C	20.7	FA	91.4	L	5		0.20		&0.01	256	SCO01

Periodic Comet Slaughter-Burnham (1992w)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 11 19.13	C	16.9	L	65	L	4		0.35		0.02	251	PRA01
1993 11 19.13	c	17.6	L	65	L	4		0.35		0.02	251	PRA01
1993 11 20.01	c	17.9	L	65	L	4		+ 0.12		0.01	248	PRA01

Periodic Comet Shoemaker-Levy 9 (1993e)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 05 20.24	I[	13.5:		41	L	4	183					HAL
1993 05 25.60	C	14.5	GA	60.0	Y	6		1.05		0.05	253	NAK01
1993 06 08.21	I[	13.5:		41	L	4	183					HAL
1993 07 19.48	C	15.2:	HS	60.0	Y	6		1.2				NAK01

Periodic Comet Helin-Lawrence (19931)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 06 10.21	I	[13.5:		41	L	4	183					HAL
1993 06 11.63	C	15.8	GA	60.0	Y	6		0.25			290	NAK01
1993 09 05.46	C	16.8	HS	60.0	Y	6		0.25				NAK01
1993 10 10.42	C	17.2	GA	60.0	Y	6		0.15				NAK01

Periodic Comet Mueller 5 (1993s)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 12 10.41	c	20.6	FA	91.4	L	5		0.17		&0.03	266	SCO01
1993 12 10.42	C	17.4	FA	91.4	L	5						SCO01

◇ ◇ ◇

Recent News and Research Concerning Comets

It has been six months since I last wrote this column, and much has happened. Much excitement preceded the August 12 maximum of the Perseid meteor shower, with speculation circulating that this was as good a time as any for a significant shower to occur; while the display was quite nice, it didn't turn out to be anything approaching a meteor storm, and it drew attention to the facts that few people are involved in meteor research these days and that much needs to be learned still about the evolution and characteristics of meteor streams.

The most significant new event of the past six months is probably the accidental recovery of P/Spitaler, a comet with a 7-year orbital period that had been lost since its discovery apparition in 1890, which had made 14 unobserved returns in the interim. James V. Scotti found the comet and wondered whether it might be P/van Houten or P/Spitaler; astrometric observations were used by B. G. Marsden to show that Scotti's new object was indeed P/Spitaler, off from a 1992 prediction by S. Nakano by $\Delta T = +108.7$ days, and the object retained its original name and was given the designation 1993r. Scotti's October 24 observations showed a 18″ coma and a short tail toward the southwest, with $m_1 = 17.2$; little brightening was forecast, however.

Of the five new comets discovered in the past six months (all being found photographically), two were credited to Jean Mueller at Palomar (U.S.A.) and two were credited to Yoshio Kushida at Yatsugatake (Japan). Both of the Japanese comets have short periods: P/Kushida-Muramatsu (1993t) and P/Kushida (1994a), and the latter object is near tenth magnitude as this is being written. Comet 1993t was at mag 16-16.5 when found by Kushida and Osamu Muramatsu on films taken on December 8 and 9. Mueller found comets 1993p (which has been widely observed by visual observers) and 1993s (which is a fainter short-period comet now known as P/Mueller 5) on plates taken on Aug. 16 and on Nov. 20-21 (respectively) with the 48-inch Schmidt telescope in the course of the second Palomar Sky Survey. The fifth new comet, 1993v, was found by Robert H. McNaught on a U.K. Schmidt Telescope plate taken by Kenneth S. Russell on Dec. 17, the total mag given as 17.5; this object could brighten to mag 11 for northern-hemisphere observers in April.

Periodic comets West-Kohoutek-Ikemura, Urata-Niijima, and Wiseman-Skiff were recovered by Scotti as comets 1993o, 1993q, and 1993u, respectively. P/West-Kohoutek-Ikemura was found on CCD images taken July 20 and 21, close to the prediction at $m_1 = 20.1$. The other two comets were both making their first predicted returns; for P/Urata-Niijima, a correction to the predicted time of perihelion was required such that $\Delta T = +0.24$ day, but P/Wiseman-Skiff was off by only $\Delta T = -0.08$ day. Scotti's Dec. 10 and 16 images of comet 1993u confirmed three images obtained by B. Schmidt and G. V. Williams the previous Feb. 2 with the Multiple Mirror Telescope at Mount Hopkins in Arizona.

Scotti has produced a series of astrometric measurments for nine of the nuclei of P/Shoemaker-Levy 9 (1993e), which has permitted Marsden to compute orbits for each nucleus. The first of these nuclei will enter the atmosphere on July 17.6 and the last on July 22.3 UT, with uncertainties estimated around ± 0.1 day. D. K. Yeomans and P. W. Chodas note that these impacts will now occur closer to the morning terminator on Jupiter, though still on the far side by 5°-10°. Recent spectacular images of the comet (Jan. 14) taken by D. Jewitt and J. Chen at Mauna Kea show changes in the relative brightnesses of individual nuclei, which each have individual tails — that from the brightest nucleus (#7) being as long as 1′ or more.

Two different comets reported on single nights on U.K. Schmidt plates in 1978 May and 1979 March are apparently the same object, as supported by additional observations found at Siding Spring in 1978 April and 1980 January; the object has a large perihelion distance of 6.28 AU and has been named McNaught-Tritton 1978 XXVII (*IAUC* 5866).

Most readers are probably now aware of the U.S. spacecraft known as 'Clementine' launched in January that will observe the moon for two months before making a flyby of the near-Earth asteroid (1620) Geographos on August 31. It took only two years to go from approval of Clementine to launch, and the joint venture between the Ballistic Missiles Defense Organization and NASA is costing about ten times less than a typical NASA mission — around US$75 million — food for thought. Less-well known is the fact that, according to writer Steve Nadis [*New Scientist* **141**(1909), 38], the U.S. Defense Department has already built parts for 'Clementine 2', which is actually planned to fire four missiles (minus their explosive warheads) at two more near-Earth asteroids (possibly Eros and Phaethon) to see what happens to material thrown up by the resulting impacts, and it will also travel to a comet! Clementine 2 is still on the drawing board, but it sounds interesting.

Four new trans-Neptunian objects were found in the span of a few days in mid-September and were given provisional minor-planet designations: 1993 RO and 1993 RP were found by Jewitt and Jane Luu at Mauna Kea (at Mould R magnitudes 23 and 24.5, respectively), and 1993 SB and 1993 SC were found by Iwan Williams and colleagues at La Palma (at $V = 23.2$ and 22.3). It will be some time before the orbits are known very well (if at all, since none of these four have been observed since discovery!), and some of these objects might go much closer to Neptune than does 1992 QB_1. — D. W. E. Green [1994 Jan. 31]

◇ ◇ ◇

The Last 10 Comets to Receive Provisional Letter Designations

Listed below, for handy reference, are the last 10 comets which have been given letter designations (explanation of the columns is given with the previous list, which was published in the July 1993 issue, p. 138). Note that the last column lists the 3-digit code for short-period comets as used internally in archival data (first 3 characters), and which should be used by those observers contributing data in computer-readable form.

Desig.			*Comet*	*P*	*T*	*q*	*IAUC*	P/ code
1993n	=		P/Whipple	8.5	12/22/94	3.1	5827	708
1993o	=		P/West-Kohoutek-Ikemura	6.4	12/25/93	1.6	5832	628
1993p	=	⋆	Mueller		3/26/94	0.97	5846	
1993q	=		P/Urata-Niijima	6.6	7/13/93	1.46	5882	639
1993r	=	#	P/Spitaler	7.1	1/28/94	2.1	5885	605
1993s	=	⋆	P/Mueller 5	13.8	9/10/94	4.3	5891	955
1993t	=	⋆	P/Kushida-Muramatsu	7.4	12/7/93	2.7	5903	649
1993u	=		P/Wiseman-Skiff	6.5	6/4/93	1.5	5908	641
1993v	=	⋆	McNaught-Russell		3/31/94	0.87	5910	
1994a	=	⋆	P/Kushida	7.3	12/12/93	1.4	5918	731

Φ Φ Φ

ĽUBOR KRESÁK (1927-1994)

Ľubor Kresák, a member of the advisory board of this journal since 1986, and for many years the leader of the group working on interplanetary matter at the Astronomical Institute of the Slovak Academy of Sciences, died suddenly on 1994 January 20 at his home in Bratislava.

Born in Topol'čany, Slovakia, on 1927 August 23, Kresák studied at the Charles University in Prague. At the end of World War II, Bečvář initiated the celebrated visual comet-hunting program at Skalnaté Pleso. Although new discoveries were followed up photographically, there was initially no facility in Slovakia for measuring the plates; the measurements had to be done in Prague, and Kresák participated in this work and related orbit determinations while still a student. In 1951 he became an on-site participant in the Skalnaté Pleso program and almost immediately discovered the short-period comet he was able to link with observations made in 1858 and 1907 and that became known as P/Tuttle-Giacobini-Kresák. A second comet discovery came in 1954, soon after which he moved to Bratislava. It was at Skalnaté Pleso that he met his future wife Gita Vozárová, who also discovered a comet in 1954 and who has often collaborated with him in his work, while also maintaining an active program of research on meteors in her own right.

Kresák was equally at home carrying out research on either comets or meteors, a dominant theme in his work being the relationship among comets, meteors and asteroids. He always tried to get "the big picture". His papers habitually showed tremendous insight into the particular problem at hand, as he backed up his ideas with his fantastically detailed knowledge of specific objects. He could just as readily discuss selection effects involving cometary discoveries as the long-term evolution of a meteor stream, or as enthusiastically write about cometary aging processes as the orbits of fireballs. Perhaps his most significant and influential contribution involved his advocacy of the use of the Tisserand parameter in any dynamical comparison of different members of the solar system. In the pre-computer age he had a great interest in nomograms and published a useful one for computing cometary magnitudes. Specific more modern computational results for which he was largely responsible were his realization that a comet observed rather imperfectly by Pons in 1808 was an early appearance of P/Grigg-Skjellerup, the confirmation that La Hire's comet of 1678 was P/d'Arrest, and the indication that P/Van Biesbroeck and P/Neujmin 3 were separate components of a comet that split a century and a half ago.

Kresák was particularly active in the International Astronomical Union, organizing a very successful symposium on meteors not far from Skalnaté Pleso in 1967 and serving as president of the commissions involved with orbital work on comets and asteroids and physical studies of these bodies during 1973-1976 and 1985-1988, respectively. The international renown he enjoyed is illustrated by his election as a Vice President of the IAU for 1979-1985 and by the organization of an international symposium near Bratislava in honor of his 65th birthday. The latter was of some significance, for deterioration of his health had made it advisable for him to curtail his travel in recent years. Ľubor and Gita did make one final foray together to IAU Symposium No. 160 on the shore of Lake Maggiore in June 1993. This was a highly successful meeting in the "ACM" ("Asteroids, Comets, Meteors") series, and his invited review was a prescient and comprehensive study of our knowledge of the extent, origin and evolution of the entire population of comets.

— *Brian G. Marsden*