

The Comets of 1990

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This report is the first in what will be an annual series which will give for each comet: the discovery details, orbital data and general information, magnitude parameters and BAA comet section observations. It continues the series which last appeared in the Journal in 1950¹, with irregular notes appearing until the early 60s. Observational reports were published in the comet section newsletter *Isti Mirant Stella* from 1973 to 1987 and a couple of papers were published in the Journal in the early 1980's^{2,3}. Further details of the analysis techniques used in this report are given in an earlier paper⁴.

Table 1 - Orbital data for the comets of 1990⁵

Comet		T	q	e	P	w	W	i
a P/Wild 4	1990 X	90 July 2.5315	1.988634	0.407872	6.15	170.5408	22.1104	3.7210
b Cernis-Kiuchi-Nakamura	1990 III	90 Mar. 17.3264	1.068339	1.0		100.6214	348.4449	48.1425
c Levy	1990 XX	90 Oct. 24.6837	0.938705	1.000417		242.6656	139.3647	131.5829
d P/Peters-Hartley	1990 IX	90 June 23.6422	1.625781	0.597924	8.13	338.3040	260.1040	29.8342
e P/Wolf-Harrington	1991 V	91 Apr. 4.8339	1.607839	0.539051	6.51	186.9531	254.8903	18.4720
f P/Honda-Mrkos-Pajdusakova	1990 XIV	90 Sept. 12.6864	0.541120	0.821936	5.30	325.7904	89.3201	4.2219
g McNaught-Hughes	1991 III	91 Feb. 27.6666	2.682238	1.001198		18.1719	233.2060	132.7742
h P/Johnson	1990 XXIII	90 Nov. 18.9631	2.312561	0.366148	6.97	208.3001	117.3494	13.6610
i Tsuchiya-Kiuchi	1990 XVII	90 Sept. 28.7418	1.092424	0.995316		180.9189	330.7378	143.7840
j P/Mueller 2	1990 XXIV	90 Nov. 19.8886	2.082993	0.405714	6.56	171.0235	218.8553	7.0700
k P/Holt-Olmstead	1990 XVIII	90 Oct. 4.5198	2.043331	0.392228	6.16	2.5960	15.3223	14.8915
l P/Mueller 3	1990 XIII	90 Aug. 1.9271	2.998114	0.288340	8.65	226.0345	138.0064	9.4310
m P/Harrington-Abell	1991 X	91 July 6.9277	1.774389	0.540439	7.59	138.6639	337.3453	10.1828
n P/Taylor	1990 XXX	90 Dec. 28.9296	1.950364	0.465565	6.97	355.5949	108.8659	20.5510
o P/Shoemaker-Levy 1	1990 XV	90 Sept. 18.5868	1.523994	0.771786	17.3	310.6179	52.0452	24.3320
p P/Shoemaker-Levy 2	1990 XVI	90 Sept. 25.3934	1.844051	0.582306	9.28	140.0786	235.9958	4.6372
P/Encke	1990 XXI	90 Oct. 28.5665	0.330885	0.850220	3.28	186.2339	334.7500	11.9452

The epoch of the elements for each comet is for the Julian Date ending in zero closest to the date of perihelion.

Table 2 - Contributing observers

Visual Observers:

James Abbott, Witham, Essex
 Karl-Gustav Andersson, Sweden
 Hans Bengtsson, Sweden
 Peter Birtwhistle, Birmingham
 Andrea Boattini, Italy
 John E. Bortle, U.S.A.
 Steve Brincat, Malta
 Robert Bullen, Bognor Regis, West Sussex
 Mike J. Collins, England
 Haakon Dahle, Norway
 Jorgen Danielsson, Sweden

Anders Ekloef, Sweden
 Jens Ergon, Sweden
 Daniel Fischer, Germany
 James Fraser, Alness, Rossshire
 A Gambin, Malta
 Bjoern Haakon Granslo, Norway
 Werner Hasubick, Germany
 Roberto Haver, Italy
 Guy M. Hurst, Basingstoke, Hampshire
 Jost Jahn, Germany
 Christer Jansson, Sweden
 Albert F. Jones, New Zealand
 Timo Karhola, Sweden
 Graham Keitch, Manaton, Devon
 Mark Kidger, Canary Islands
 Norman S. Kiernan, Pulborough, West Sussex
 Stefan Korth, Germany
 Trond Larsen, Norway
 Hartwig Luethen, Germany
 Jose Carvajal Martinez, Spain
 Richard McKim, Oundle, Northamptonshire
 Oernulf Midtskogen, Norway
 Herman Mikuz, Slovenia
 Michael Moeller, Germany
 David Moore, Dublin, Eire
 Roy W. Panther, Walgrave, Northampton
 Andrew R. Pearce, Australia
 Alfredo Jose Serra Pereira, Portugal
 Jose Ripero Osorio, Spain
 Patrick Schmeer, Germany
 Jonathan D. Shanklin, Cambridge
 Tony Tanti, Malta
 Melvyn D. Taylor, Wakefield, Yorkshire
 Frank Ventura, Malta
 Christian Vestergaard, Sweden
 Fiona Vincent, St Andrews, Fife
 Johan Warell, Sweden
 Mats Yderstig, Sweden

Astrometric and Photographic Observers:

Observer	Site	IAU Station No
Denis G. Buczynski,	Conder Brow, Lancashire	978
Jean Dragesco,	France	
John R. Fletcher,	Lenton, Nottinghamshire.	
Richard T. Glynn,	Okehampton, Devon	
Werner Hasubick,	Germany	
Alan Heath,	Nottingham	
Michael J. Hendrie,	Colchester, Essex	502
Brian Manning	Kidderminster, Worcs	494

Herman Mikuz,	Slovenia.	
Martin Mobberley,	Cockfield, Suffolk	480
Stewart Moore,	Fleet, Hampshire.	
Bob Neville,	Towcester, Northants.	
Harold B. Ridley	Eastfield, Somerset	984
Jonathan D. Shanklin,	Cambridge	503
John W Smith,	Sandown, Isle of Wight.	
W Graeme Waddington	Oxford	996

Table 3 - Magnitude parameters of comets observed by the comet section. A correction for aperture of 0.0033 mm^{-1} and the observer corrections derived in previous papers^{4,6} have been applied. Apart from comet Levy, no comet had a sufficiently large coma to warrant including the coma correction.

Comet	H1	K1	H10	H15
a P/Wild 4	5.9ñ1.4	15ñ4	7.4ñ0.4	5.8ñ0.5
b Cernis-Kiuchi-Nakamura	6.5ñ0.2	24ñ3	7.1ñ0.1	6.9ñ0.1
c Levy	4.5ñ0.1	6.9ñ0.2	3.9ñ0.1	2.7ñ0.1
d P/Peters-Hartley	---	---	9.6ñ0.2	8.5ñ0.2
e P/Wolf-Harrington	---	---	7.7ñ1.0	6.6ñ1.0
f P/Honda-Mrkos-Pajdusakova	13.3ñ0.1	20.2ñ0.8	12.1ñ0.3	12.7ñ0.2
g McNaught-Hughes	---	---	6.3ñ1.0	4.1ñ1.0
i Tsuchiya-Kiuchi	5.3ñ0.1	11.8ñ0.9	5.5ñ0.1	4.8ñ0.1
o P/Shoemaker-Levy 1	---	---	9.5ñ1.0	8.3ñ1.0
P/Encke	9.6ñ0.1	6.9ñ0.7	10.1ñ0.1	10.8ñ0.2

The magnitude of the comets can be calculated from the equation:

$$m = H1 + 5.0 * \log(\Delta) + K1 * \log(r)$$

For most comets there are insufficient observations to calculate K1 accurately and so a value of 10 or 15 is assumed, which gives the constant H10 or H15 respectively.

a P/Wild 4 (1990 X)

Discovered on January 21.98 by Paul Wild with the 0.40-m Schmidt at the Zimmerwald station of the Berne Astronomical Institute at a photographic magnitude of 13.5, when the comet was near opposition, moving slowly NW in Leo [IAUC 4950, January 23]. Astrometric observations by Brian Manning were used in the early orbit determinations. The comet was perturbed into its present orbit after

a close approach to Jupiter in July 1987. At its brightest the comet only reached 12^m, but it was surprisingly well observed, with 80 observations made between January 24th (Perihelion-160 days or T-160) and May 22nd (T-40). The observed arc is rather small (2.32 to 2.01 AU) so that K1 is not well determined.

Fig 1
Light curve

Andrew Pearce was able to observe the comet with his 0.32-m reflector soon after the announcement circular appeared, and he found it to be well condensed, DC5, and 13.5^m, with a coma diameter of 0.6'. Oernulf Midtskogen, observing with his 0.32-m reflector a month later estimated its magnitude as 12.1, with a well condensed, DC5 coma, 2' in diameter. Jonathan Shanklin, using the 0.30-m Northumberland refractor of the Cambridge University Observatories made it 12.9 on March 25, when it had become less condensed and smaller, with a DC3 coma of 1.1' diameter. Graham Keitch made the final observation on May 22, when it was 13.0^m in his 0.30-m reflector, with a 0.5' diameter coma.

b Cernis-Kiuchi-Nakamura (1990 III)

Discovered on March 14.79 by Kazimieras Cernis with a 0.12-m refractor at a visual magnitude of 9 at Vilnius, Lithuania and independently on March 16.44 by two Japanese observers, Tsuruhiko Kiuchi and Yuji Nakamura with 25x150B and 20x120B respectively [IAUC 4980, March 17]. The comet was moving north east in Andromeda. A photograph of the comet by Martin Mobberley appeared in the Journal⁷. At its brightest the comet reached 8^m and was fairly well observed by section members with 79 observations made between March 18 (T+1) and April 29 (T+43). Again the arc is fairly small (1.07 to 1.28 AU), and the comet also became more diffuse and required larger apertures for observation so that K1 is not well determined.

Fig 2 ###
Light curve

The comet initially had a small, well condensed coma and was around 8.5^m. Werner Hasubick observing with his 0.20-m Schmidt-Cassegrain on March 18 made it 8.7 with a moderately well condensed DC4 coma 1.8' in diameter. Over the next week it brightened; Guy Hurst observing with 15x80B on the 24th estimated that it was 7.9^m, with a well condensed coma, DC5 and 6' in diameter. Several observers reported a possible tail up to 20' long, however the reported position angles (pa) are inconsistent and it does not show on photographs obtained by Michael Hendrie, Mobberley⁸ or Harold Ridley. By the end of the month it was fading; Johan Warell observing with a 0.15-m reflector on the 30th put the magnitude at 9.5 with the central condensation becoming smaller

and starlike in a diffuse coma 2' in diameter. The coma steadily became more diffuse throughout April and the comet faded; Midtskogen observing on the 28th with his 0.32-m reflector estimated the magnitude as 10.8, with the diffuse coma 1.1' in diameter and DC2.

Fig 3 ###
Picture of comet

c Levy (1990 XX)

Visually discovered by David Levy of Tucson, Arizona with his 0.41-m reflector at magnitude 9.6 on May 20.44 [IAUC 5017, May 21]. A full report on this comet was published in the Journal⁶ and photographs of it were also published during the apparition^{9,10,11}.

d P/Peters-Hartley (1990 IX)

Recovered by Rob McNaught with the Uppsala Southern Schmidt (USS) at Siding Spring, Australia at photographic magnitude 14 on May 26.44 a month before perihelion [IAUC 5026, May 29]. This was the third observed return of the comet, which was discovered in 1846, then lost until it was accidentally recovered in 1982. Pearce reported the only observations (it was too far south for northern hemisphere observation), making it around 13^m, with a very diffuse coma just over 1' in diameter in his 0.41-m reflector when it was in the evening sky near the time of perihelion. At its first apparition the comet was quite bright, 8-9^m, which suggests that the absolute magnitude of the comet has faded over the past 150 years.

e P/Wolf-Harrington (1991 V)

Recovered by James V Scotti of the Lunar and Planetary Observatory, University of Arizona with the 0.91-m Spacewatch CCD telescope at Kitt Peak (SWT) on June 14.38 at a magnitude of 19.5 [IAUC 5033, June 15]. This was the eighth observed return of the comet, which was discovered in 1924, then lost until 1951. The comet is in a chaotic orbit, and made a close approach to Jupiter in 1936 which reduced its perihelion distance from 2.4 to 1.6 AU. Although the comet was reasonably placed for observation from the UK prior to perihelion, Pearce was again the only visual observer of this comet, making it around 13^m with a weakly condensed coma some 45" in diameter, near the time of perihelion in April 1991, when it was approaching conjunction in the evening sky. Hasubick was able to photograph it from the northern hemisphere, estimating that the comet was 14^m on January 3.

f P/Honda-Mrkos-Pajdusakova (1990 XIV)

Recovered by Scotti with the SWT on June 17.42 at a magnitude of 19.5 [IAUC 5035, June 19]. Independently recovered by James Gibson of the OAO Corporation and Jet Propulsion Laboratory with a CCD on the 1.6-m telescope at Palomar on June 17.43. [IAUC 5046, July 2]. This was the eighth observed return of the comet, which was discovered in 1948, and has only been missed at the 1959 return. The earth approaches the comet orbit quite closely and it could produce meteor activity in early August (possibly the Alpha Capricornid stream) and mid February. Although a relatively favourable apparition in terms of geometry, the comet was only observable in the morning sky, which discouraged most observers. Twenty observations of the comet were made as the comet approached the sun between July 23 (T-52) and September 23 (T+10), with a maximum brightness of around 8^m. When first picked up in late July the comet was around 12.5^m, totally diffuse and a few minutes in diameter. It brightened rapidly in August and by the time the moon had left the sky at the end of the month it was nearly 8^m and had become more condensed. It was visible for a further ten days past perihelion, and with increasing distance from the earth and sun faded to nearly 9^m. The range of solar distance (1.12 to 0.54 AU) is sufficient to make a reasonable determination of the magnitude parameters, which agree well with those presently used by the ICQ¹².

Fig 4 ###
Light curve

g McNaught-Hughes (1991 III)

Discovered by McNaught and Shaun M Hughes with the UK Schmidt at Siding Spring on June 19.55 at photographic magnitude 17 [IAUC 5036, June 20]. Pearce made a single observation of the comet in April 1991 when the comet was at opposition, estimating that it was 13^m.

h P/Johnson (1990 XXIII)

Recovered by Gibson using a CCD on the 1.5-m telescope at Palomar on June 17.37 at magnitude 18 [IAUC 5038, June 26]. When discovered in 1949 it was photographic magnitude 13.7, but it does not seem to have been observed visually, and this return, the seventh, was no exception.

i Tsuchiya-Kiuchi (1990 XVII)

Discovered by two Japanese observers: photographically by Kiyoshi Tsuchiya with an f4 camera at magnitude 8 on July 13.52 and visually by Tsuruhiko Kiuchi with 25x150B at magnitude 9 on July 16.51 [IAUC 5052, July 16]. The comet was moving SW in Coma Berenices. It is a little surprising that the comet wasn't discovered a month earlier as it was well placed in the evening sky and brighter than 10^m. The comet was relatively well observed, reaching a maximum brightness of 7^m, and 71 observations were made between July 17 (T-52) and 1991 January 18 (T+111). The range in solar distance (1.11 - 2.03 AU) allows a good determination of the magnitude parameters.

Peter Birtwhistle managed to make a couple of observations in the days following the discovery circular. On July 18 he estimated it at 9.2 with his 0.21-m reflector in twilight conditions. It was the same magnitude two days later with a diffuse 2' coma of DC1. After discovery it steadily moved south and closer to the sun, becoming invisible after mid August. Midtskogen was among the last to see it, making it 8.1 in his 0.32-m reflector with a 2' coma and DC4 on August 12th. After perihelion it became visible in the morning sky in mid October; Midtskogen recovered it on the 12th at 8.4, with a strongly condensed coma, DC5, diameter 1.5'. Some observers reported a short tail around 30' long in pa 270 around October 23rd. It continued moving south and Roy Panther was the last to see the comet from the UK, when he made it 9.0 in his 0.25-m reflector on November 6th with a moderately condensed coma DC3, diameter 4.5'. The comet continued to fade and became less condensed as it receded from the sun. Pearce and Albert Jones continued observations from the southern hemisphere, with Jones making the final observation on 1991 January 18, when it was 10.9 in his 0.32-m reflector with a diameter of 2.5' and DC1.

Fig 5 ###
Light curve

j P/Mueller 2 (1990 XXIV)

Discovered by Jean Mueller with the 1.2-m Oschin Schmidt on Mt Palomar (POS) during the course of the 2nd Palomar Sky Survey on September 15.35 at photographic magnitude 17 [IAUC 5091, September 17]. The comet belongs to the Jupiter family, though there was no recent close approach prior to discovery.

k P/Holt-Olmstead (1990 XVIII)

Discovered by Henry E Holt and C Michelle Olmstead with the 0.46-m Schmidt on Mt Palomar (PS) on September 14.35 at photographic magnitude 17.5 [IAUC 5093, September 18]. Holt works with the Shoemakers, who frequently go to Australia during the summer months and this was the fifth comet named for him. The comet also belongs to the Jupiter family and there was a close approach in 1981.

l P/Mueller 3 (1990 XIII)

Discovered by Mueller with the POS on September 24.36 at photographic magnitude 18 [IAUC 5102, September 26]. Another comet belonging to the Jupiter family and there was a moderately close approach in 1983.

m P/Harrington-Abell (1991 X)

Recovered by Scotti with the SWT on October 22.26 at a magnitude of 21. Independently recovered by Hans Rickman of the Uppsala Observatory using the 2-m reflector on October 23.89 [IAUC 5129, October 31]. This was the sixth observed return of the comet since its discovery in 1954 and it has never become brighter than 17^m.

n P/Taylor (1990 XXX)

Recovered by Scotti with the SWT on November 11.51 at a magnitude of 19.7 [IAUC 5134, November 13]. A series of encounters with Jupiter last century reduced q from 3.1 to 1.6 AU and led to the comet's discovery in 1915 when it reached 9^m. E E Barnard observed that it had split in February 1916; initially the 'A' nucleus was the brighter, but it soon faded from view, and the 'B' component also faded more rapidly than expected. The comet was then lost, but a search in 1977 successfully recovered the B component, which reached

16^m when brightest. The period is just under seven years, and this return, the fourth observed, was very similar to that of the previous two. The next two will also be similar, but after that an encounter with Jupiter will increase q to 2.3 AU.

o P/Shoemaker-Levy 1 (1990 XV)

Discovered by the team of Carolyn and Eugene Shoemaker and Levy (SLT) with the PS on November 15.29, when the comet was at opposition, at a photographic magnitude of 13 [IAUC 5135, November 16]. The 17 year period takes it out to twice the distance of Jupiter, but close approaches are possible. Harold Ridley took an astrometric plate on November 20.90, when it was 13.5^m with a well condensed, 30" diameter coma. Pearce made two observations of the comet a week after discovery, when it was 13^m visually. It faded rapidly and no further visual observations were made.

p P/Shoemaker-Levy 2 (1990 XVI)

Discovered by the SLT with the PS on November 17.44 at a photographic magnitude of 17.6 as asteroid 1990 UL₃. [IAUC 5135, November 16]. Follow up plates by Steve Larson and Levy using a CCD on the Catalina 1.5-m reflector on December 19.32 showed that it had a tail and it was reclassified as a comet [IAUC 5149, December 21]. It never showed a coma and is another object that is transitional between comets and minor planets. It is in a Jupiter crossing orbit and passed by the planet in 1983 on its way to aphelion.

Comet P/Encke (1990 XXI)

Comet P/Encke was at perihelion on October 28.57. It is not given a provisional designation because it can be observed all the way round its orbit and this was the 56th observed return to perihelion since its discovery by Mechain in 1786. The orbit is quite stable, and with a period of 3.3 years apparitions repeat on a 10 year cycle. The comet is the progenitor of the Taurid meteor complex and may be associated with several Apollo asteroids. There is some evidence for a secular fading, and certainly it is not an easy object to observe, even though it can get relatively bright. This was a morning apparition which probably discouraged many members from making observations at what was quite a good apparition. Forty observations were made between August 30 (T-59) and October 17 (T-11) after which it was too close to the sun for further observation. Although the observational interval is short, the eccentric orbit took the comet from 1.27 to 0.45 AU in this time and it brightened rapidly as it approached the sun reaching a maximum brightness of 7^m.

Manning photographed the comet on August 23rd and John Bortle picked up the comet visually at the end of August in his 0.32-m reflector when it was 11^m and totally diffuse. It was a much fainter object photographically than it was visually. By the end of the September it was visible in binoculars. Shanklin observing on the 26th made it 8.1 in 20x80B, with a 2.7', DC2 coma. By mid October it has brightened

further and had become well condensed. Hasubick observing on the 15th made it 7.3 in 14x100B, but it was becoming a difficult object and no further observations were made after the 17th.

Fig 6 ###
Light curve

Fig 7 ###
Sketch by Bullen

Other comets

P/Schwassmann-Wachmann (1) was in outburst in the latter part of the year with a magnitude of around 13.5 reported from mid September to early November and also in mid December. This comet would repay monitoring by observers equipped with CCD equipment as it seems to be spending more time in outburst than at quiescence; on occasion it has reached 10^m, though when quiescent it is 18^m. The comet was discovered in 1927 and is in a low eccentricity orbit just outside that of Jupiter. Its behaviour is very erratic and a recent paper in *Nature*¹³ suggests that the outbursts are driven by carbon monoxide.

Asteroid 2060 Chiron was observed to have a 10" coma by Karen Meech at Hawaii using the 2.2-m telescope at the end of 1989 and the coma was measured at 16" on February 21. There was a possible outburst between September and December.

Acknowledgements

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References

1. Merton, G. Comet section report for 1949. *JBAA*, 60 (8), pp240-243, (1950).
2. Hendrie, M. J. & Keitch, G. S. Comet Kohler 1977 XIV. *JBAA*, 91 (3), pp251-260, (1981).
3. Hendrie, M. J. & Morris, C. S. Photometric Parameters of Comets: 1948 - 1954. *JBAA* 93 (1), pp1-6, (1982).
4. Shanklin, J. D. Comet Analyses. *JBAA*, 105 (1995).
5. Marsden, B. G. *Catalogue of Cometary Orbits*, 9th edition, IAU CBAT, (1994).
6. Shanklin, J. D. Comet Levy 1990 c. *JBAA*, 105 (1995).
7. Observer's Forum. *JBAA*, 100 (3), p142, (1990).
8. Mobberley, M. P. Cover picture, 1990 b, *TA*, 26 (312), (1990).

9. Mobberley, M. P. Cover picture, 1990 c, *JBAA*, 100 (6), (1990).
10. Shanklin, J. D. Comet News. *JBAA*, 100 (5), p208, (1990).
11. Observer's Forum. *JBAA*, 100 (6), pp310-311, (1990).
12. Nakano, S. (Ed). ICQ Handbook 1990.
13. Senay, M. C. & Jewitt, D. *Nature*, 371, pp229-231, (1994).

Figure Captions:

Figure 1. The observed magnitude of comet P/Wild 4. The curve is a best fit over the apparition, with no corrections applied. Tick marks indicate the first of each month from 1990 January 1. The scatter between observers is accentuated by the scale of the magnitude axis.

Figure 2. The observed magnitude of comet Cernis-Kiuchi-Nakamura. The curve is a best fit over the apparition, with no corrections applied. Tick marks indicate the first of each month from 1990 March 1.

Figure 3. Comet Cernis-Kiuchi-Nakamura photographed by *Harold Ridley* on 1990 March 22.87 with a 0.17-m aperture f7 lens; exposure 15 minutes on Kodak T-Max 400. The scale is 30"/mm with north at the top.

Figure 4. The observed magnitude of comet P/Honda-Mrkos-Pajdusakova. The curve is a best fit over the apparition, with no corrections applied. Tick marks indicate the first of each month from 1990 July 1.

Figure 5. The observed magnitude of comet Tsuchiya-Kiuchi. The curve is a best fit over the apparition, with no corrections applied. Tick marks indicate the first of each month from 1990 July 1.

Figure 6. The observed magnitude of comet P/Encke. The curve is a best fit over the apparition, with no corrections applied. Tick marks indicate the first of each month from 1990 September 1.

Figure 7. Sketch of comet P/Encke made by *Robert Bullen* using a 0.22-m f7 reflector x69 on 1990 September 24.14.