THE BRITISH ASTRONOMICAL ASSOCIATION

COMET SECTION

NEWSLETTER FEBRUARY 1994

Recently, there have only been two comets available to observers, P/Schwassmann-Wachmann 2 and the newly-discovered P/Kushida 1994a. Both of these objects have been well-placed for observation around midnight. Although faint for visual observers, they have been well-suited for CCD imaging. Observations made at Conder Brow during the past few weeks have proved the value of this new technology to Glyn Marsh and myself.

P/Kushida 1994a was imaged using a Starlight Xpress camera and a 5" Celestron Comet-Catcher. The resulting frames enabled Nick James to produce accurate astrometry using the Hubble Space Telescope Guide Star Catalogue.

Electronic imaging and measurement is easy when compared to conventional photography and plate measurement. Observation, identification, measurement and data transmission are virtually push-button procedures. I now understand how Japanese observers produce numerous astrometric results so quickly. This seems to be the way forward for UK observers interested in cometry astrometry.

P/Schwassmann-Wachmann 2 has proved very interesting. The predicted magnitude of the comet for the past few weeks has been around 10 - 11. However, our CCD observations seem to show a brighter and more developed comet, complete with tail, than we expected. We are attempting some photometry to see if we have witnessed this comet in outburst. We would be interested to hear from any other observers who have also been following this object during the past few weeks.

The CCD appears to be an ideal detector for comet observers. More sensitive than photography, more reliable than visual observation, and it combines with an ease of data handling. I see a bright future for our chosen field amongst amateurs. We have already seen a CCD image and astrometric position of P/Spitaler by Martin Mobberley published in TA. This is by far the faintest comet observed and reported by an amateur in this country.

Of course, a potential irony is that the "next bright comet" which we have all eagerly anticipated for so long, may prove too bright for our new technology!!

Denis Buczynski
Editor

Prospects for 1994

The past year has been a quiet, not to say dull, one, with no bright comets and, remarkably, no discoveries by amateurs*. However, the year has not been without interest, the highlight being the discovery of P/Shoemaker-Levy 9, the "string of pearls" comet torn apart by Jupiter's gravity. The final collision with the planet in July will be of intense interest; although hidden from us, the aftermath may well be visible as some disturbance of the cloud-patterns on Jupiter's disc. The other item of interest was the rediscovery of P/Spitaler, not seen since its original discovery nearly a century ago.
Apart from the forthcoming collision, there is nothing spectacular in prospect. Two or three of the returning short-period comets may be fairly bright, but none are likely to reach naked-eye visibility. Once again we must urge the patient seekers not to lose heart, but to increase their efforts to find us something worth looking at. * See Late News

<u>P/Schwassmann-Wachmann 1</u> Three outbursts of this comet were reported in 1993: in February, April and November, magnitudes between $12\frac{1}{2}$ - 13 being recorded. Continued surveillance is required to ensure that no outbursts are missed. The comet spends the first five months of 1994 in Gemini; after conjunction with the Sun, from September onwards it will be moving slowly in Cancer. Throughout the year, the basic magnitude stays around 18.
<u>P/West-Kohoutek-Ikemura</u> It looks as though the fading noted at the last two apparitions was not entirely due to unfavourable circumstances, but was partly of intrinsic origin. During the first quarter of the year the comet will be well placed in Auriga, but probably no brighter than 12 - 14 magnitude.
<u>Mueller, 1993a</u> This comet, in a retrograde orbit, has been with us for a year, slowly brightening from 15^m to 9^m in November, since when it has faded a little and perhaps become more diffuse; recent estimates are in the $9\frac{1}{2}$ - $10\frac{1}{2}$ range. It begins the year in western Pegasus, but by February it will be too close to the Sun for observation. After crossing the celestial equator in April, it moves steadily southwards; by September it will be in Telescopium, probably no brighter than 15^m.
<u>P/Schwassmann-Wachmann 2</u> Although it is never very bright this comet has been observed at every return since its discovery in 1929, and at its best may reach 11^m. The present apparition could hardly be more favourable: a perihelic opposition. Well placed, it moves from Gemini into Cancer, later passing into Leo, fading from its peak of 11^m in January to 13 by the end of May. A close encounter with Jupiter in 1997 is due to enlarge the orbit, shifting q out to 3.35 AU and thus putting the comet beyond the range of small instruments. This reverses the changes made in 1921 - 1928 which led to its discovery.
<u>P/Spitaler, 1993r</u> Recovery of this comet after nearly a century in the wilderness is of considerable interest. Discovered in 1890 when Spitaler was looking for Comet Zona, it was making a very favourable apparition, and was rated as 12^m. However, the recovery magnitude of 17.2 given by Scotti indicates that the comet may now be 4 magnitudes fainter than it was originally. If this fading is real, and occurred after the first appearance, it might help to explain the subsequent loss of the comet. The orbit is relatively stable, shallow encounters with Jupiter producing only minor changes; the original orbit was based on 22 observations over a two-month arc, and should have been good enough to ensure recovery. Later attempts to predict returns were well out: Marsden, Buckley and Nakano made predictions for the 1972, 1979 and 1994 returns respectively and were 59, 89 and 116 days early, according to recent calculations by Marsden. The comet is on its way out now, moving through Cetus and Aries, fading from 17^m to 19^m as it approaches Conjunction in July.

P/Encke This famous comet, discovered by Mechain in 1786 and with the shortest known period, is making its 56th observed apparition. Although this is a favourable return, the comet is never very easy to observe, as it stays fairly faint until its final dash to perihelion when it closes rapidly on the Sun and becomes lost in the twilight. There is some evidence of secular fading as it is now generally about a magnitude fainter than at corresponding times in its earlier appearances. At the start of the year the comet will be on the Aquarius-Pegasus border, about 10^m and moving westwards into Capricornus. How bright one sees it depends on how far it can be followed as it nears the Sun, but one cannot expect better than 7^m even when the elongation is down to 25°. This object is designated for special study by the Ulysses Comet Watch project, and it is hoped that observers will make every effort to follow it as far as possible.

P/Kojima, 1992z The orbit of this faint object is chaotic, oscillating between the 1/2 and 3/4 resonances with Jupiter. An encounter in 1962 reduced q to 1.6 AU and led to discovery in 1970, when the comet reached $13\frac{1}{2}^m$. A further perturbation in 1973 shifted q out to 2.4 AU, where it has remained. The subsequent two apparitions were poor, at 18^m and although the present one is optimum - a perihelic opposition - it will be unlikely to yield better than 15^m at that time. The comet moves slowly in Leo, near Regulus, during the first four months of the year, later moving eastwards into Virgo and fading to 17^m as it closes on the Sun. An encounter with Jupiter in 1996 will reduce q to 2.0 AU.

P/Tempel 2 This comet will be making its 19th observed apparition since its discovery in 1873. In a good year such as 1988 the comet gets to 8^m, but the $5\frac{1}{2}$-year period means that alternate returns are unfavourable, and such is the case this time. The light-curve is highly asymmetrical; after a late 'turn-on' there is a rapid rise in brightness to perihelion which continues more slowly for the next two or three weeks, followed by a slow decline until the 'turn-off' steepens the curve. In three of the four perihelia since discovery occurring within a month of the present one the comet has been missed completely and the other one produced a feeble 18^m maximum. Perhaps it would be better to play this one by eye and see what happens - probably on the monitor screen of a CCD camera. The orbit is very stable, one reason why this comet has been a favourite target for cancelled space missions. In 1983 the IRAS satellite detected an extensive dust trail behind the comet.

P/Maury This faint and distant object is unlikely to claim our attention. Discovered at Palomar in 1985, it never got brighter than 16^m. The present return is rather less favourable, and the comet will remain in the region of 17^m as it moves slowly from Capricornus through Aquarius into Pisces, keeping within a few degrees of the celestial equator.

Mueller, 1993p This high-inclination visitor has been brightening slowly since its discovery in 1993 August and will start the year in Aquarius at about 10^m. As it moves southwards, approaching its March perihelion it will enter Sculptor and Phoenix, reaching maximum brightness at about 7^m in April, but of course will then be for southern observers only. It then turns north again and moves rapidly eastwards into Leo in June and Virgo in August as it closes on the Sun, fading to 13^m - 14^m as it does so. This comet is a special target for the Ulysses Comet Watch, and southern-hemisphere observations will be particularly important.

P/Shoemaker-Levy 9, 1993e The story of this unique object is too well known to need repetition here. The comet will of course remain close to Jupiter until its demise. Opposition is on April 30, and the main fragments will collide with the planet during the period July 18 - 23, though the lesser components may extend those limits somewhat. Brightness is uncertain, but the integrated magnitude should be around 14 unless there is fading of some of the units. During the final days Jupiter will be in the southwestern evening sky at an elongation of 100°E, on the border of Virgo and Libra.

P/Hartley 3, 1993m Even more distant than P/Maury, and equally faint, this comet was discovered at Siding Spring in 1988.The best chance, if it can be called that, to observe it will be in the first quarter of the year when it will be moving eastwards through Aries, but no brighter than 17^m.

P/Tuttle, 1992r This interesting comet was discovered by Mechain in 1790 - poor Mechain seems to have lost out rather in the matter of comet nomenclature.At a good return it reaches 8^m,but unfortunately the present one - the eleventh observed since discovery - could hardly be worse: perihelion occurs on the opposite side of the Sun from the Earth.During the first quarter of the year the comet moves from Cygnus into Andromeda, brightening from 14^m to 12^m; after superior conjunction it moves in Hydra, fading from 11^m to 14^m.

The high inclination - $55\frac{1}{2}^o$- gives the orbit considerable stability, and a moderate approach to Jupiter in 1995 will have little effect. The perihelion distance of 0.998 AU makes possible our encounter with meteoroids from the comet, and Denning originally identified a minor stream from this source.However, the stream made a strong return in 1945 (100 per hour) observed from Czechoslovakia, and became known for a time as Becvar's Stream, though he did not in fact observe it.Since Davies and Almond at Joddrell Bank subsequently determined the orbit and confirmed the association with P/Tuttle, the shower has been known as the Ursids.The 1945 outburst was not repeated until 1986, when once again 100 meteors per hour were recorded.In other years rates have been modest, around 10 - 15 per hour, and there appears to be no extra activity when the parent comet is at perihelion; indeed the two strong displays have occurred when P/Tuttle was near aphelion.

P/Bus, 1993b Another faint one.This apparition is quite favourable, very similar to the discovery apparition of 1981, when it was observed at Siding Spring at $16\frac{1}{2}^m$. The comet spends the first half of the year in southern Leo, close to the celestial equator, moving off into Virgo as it nears the Sun at the end of the year.It should peak at 16^m - 17^m in March.This comet lives dangerously; originally perihelion was beyond Jupiter, but subsequent encounters, particularly that of 1952, rediced q to its present value of 2.2 AU. In 2021 - 2028 a further close approach will increase q to 3.6 AU, possibly putting the comet out of observational range.

P/Reinmuth 2, 1993g Although seen at every return since its discovery in 1947, and now making its eighth appearance, this is not a bright comet and only occasionally gets within range of modest instruments. This is quite a good apparition, as was that of 1987, and once again we can expect a maximum of 13^m.During the first half of the year the comet moves up from Sagittarius into Pisces in the morning sky, later continuing into Aries where it achieves maximum brightness in September, subsequently retreating and fading. The comet librates around the 4/7 resonance with Jupiter and is in a relatively stable phase at present, but severe perturbations await it in the more distant future.

P/Kohoutek This is not the infamous object of 1973, but had its share of notoriety when discovered in 1975, being involved in the imbroglio with P/West-Kohoutek-Ikemura.The orbit is very similar to that of P/Reinmuth 2, and the two comets are at perihelion within a few hours of each other.It is also not very bright, managing at best to struggle up to 13^m.This is not a very good apparition, perihelion occurring close to conjunction, and by the time the comet is clear of the Sun in September it is unlikely to be brighter than 15^m.It will then be in Cancer, moving into Sextans and Crater and fading slowly during the remainder of the year.The orbit is chaotic, librating around the 1/2 resonance with Jupiter; a close encounter in 1972 reduced q from 2.5 to 1.6 AU, leading to discovery, but in 1983 a further perturbation increased q to its present value of 1.8 AU. Like P/Reinuth 2, it is due for drastic changes in the future.

P/Tempel 1, 1993c The discovery apparition in 1867, and the two following ones, were readily observed, but perturbations by Jupiter in 1881 enlarged the orbit and the comet was missed for the next thirteen returns.Further encounters in 1941 and 1953 restored the original value of q, and predictions by Marsden and Schubart enabled Roemer to secure a single image in 1967 which was provisionally assigned to the comet.This was confirmed by recovery in 1972, and all subsequent returns have been observed.The $5\frac{1}{2}$-year period gives perihelia in January and July, the latter being favourable and applying this year. As the comet moves eastwards through Virgo during the first half of the year it should brighten from 13 - 14^m to 9 - 10^m in May-June.Moving more rapidly southeast into Sagittarius, the cpmet fades to 14^m by the end of the year.As the comet librates around the 1/2 resonance with Jupiter the orbit remains fairly stable at present, but the previous cycle of changes will repeat after a few more revolutions.

P/Wild 3 Although this is a favourable apparition, the third observed, the comet is faint and distant and is unlikely to be brighter than 15^m as it moves from Libra into Virgo and back again during the middle months of the year, going south into Sagittarius as it closes with the Sun at the end of June.The orbit has been much modified by Jupiter; a close encounter in 1882 reversed the line of apsides and reduced q from 5.2 to 4.2 AU, and a further approach in 1977 reduced it further to 2.3 AU, leading to discovery in 1980.The orbit will be stable for the next 70 years.

P/Harrington At discovery in 1953 the comet was 15^m with a 3' tail, but the next four returns were poor and two of them were missed. In 1987 favourable circumstances enabled visual observations at 13^m to be made; this year things are slightly better and the comet may be a little brighter.During the first half of the year the comet will brighten from 17^m to 14^m as it moves from Sagittarius into Aquarius.Well placed in Cetus in September, it should be 12^m- 13^m, fading back to 14^m by the end of the year.The orbit is somewhat chaotic but is in a fairly stable phase at present; only minor changes should occur during the next half century.

P/Brooks 2 This well-known object will be making its 14th observed apparition.In 1886 it experienced a hair-raising encounter with Jupiter, passing inside the orbit of Io.Like the present P/Shoemaker-Levy 9, it was tidally disrupted and the orbit was drastically altered.It is not known how many fragments were originally produced, but at discovery in 1889 the nucleus was triple.The two fainter components soon fizzled out, the major one surviving as the present comet and becoming an 8^m object with a 15' tail.As is often the case, the first apparition after encounter was unusually bright, and since 1889 the comet has not been brighter than 10^m, with only a few minutes of tail.Circumstances this time are a little less favourable than in 1987, and the comet will probably be slightly fainter.Following a similar path to P/Tempel 1, it will move from Sagittarius through Aquarius into Cetus, reaching peak brightness of 13^m in October.The orbit is fairly stable now,remaining so for the next couple of centuries.

P/Russell 2 The discovery apparition of 1980 was favourable and the return of 1987 even more so, but nothing better than 16^m was recorded. This year is not too good,and 17^m is the probable maximum brightness when, in June, the comet is well south in Hydra.The orbit is pretty stable for longer than will concern us.

P/Borelly This reliable comet, discovered in 1905, will be making its 12th observed apparition - only two have been missed.At the optimum return in 1987 it was recorded at $7\frac{1}{2}^m$, with a tail 15' long.This time is rather less favourable, but still good, and we may expect $8\frac{1}{2}$ - 9^m when the comet reaches maximum brightness in November - December.During the first half of the year it moves from Sagittarius through Sculptor into Cetus, brightening from 18^m to 13^m.Continuing northeastwards it passes through Orion and Canis Minor into Cancer, coming to maximum near the Cancer-Lynx border as the year closes.It should be under observation well into 1995 as it moves into Ursa Major.In spite of

several moderate approaches to Jupiter, the orbit undergoes only minor changes, and the comet should be with us for a very long time yet.
P/Whipple, 1993n The orbital history of this comet is a good example of the chaotic nature of many cometary orbits. Originally much larger, lying between Jupiter and Saturn, successive perturbations by the former reduced q from 6.5 to 2.5 AU, its value at discovery in 1933. A further encounter in 1981 increased it again to 3.1 AU, and after a few more revolutions it will be extended to 3.8 AU. The comet has never been very bright; the discovery magnitude of 13 has not been bettered since, and is unlikely to be. The present apparition is unfavourable, and as the comet moves from Ophiuchus through Aquarius into Pisces during April to October, it will brighten slowly from $17-18^m$ to perhaps $15 - 16^m$.
(2060) Chiron (P/Chiron) This ambiguous object is well placed during the first few months of the year, being at opposition at the end of February and moving slowly between northern Sextans and southern Leo. It should be close to 16^m, within range of observers with CCD cameras. As it is approaching perihelion there may well be a modest increase in brightness if the coma developes. Astrometry would not come amiss, as the orbit needs running update.

Late News A sudden flurry of discoveries has occurred just as these notes were ready for press. Nothing to get excited about, though - all faint, two of them getting fainter.
P/Kushida-Muramatsu, 1993t Discovered 1993 December 8, at 16^m. The comet is leaving both the Sun and the Earth now, and will slowly fade.
P/Mueller 5, 1993s Discovered 1993 November 20 at Palomar, $17^m - 18^m$, and will remain in this range of brightness throughout 1994.
McNaught-Russell, 1993v A southern object in January, moves rapidly north. Brightest in March - April as it moves through Taurus and Gemini, but is intrinsically faint, and will only be $11^m - 12^m$, even though it passes 0.5 AU from the Earth. Crosses northern circumpolar sky, quickly fading to 18^m in August.

H.B.Ridley,
Eastfield Observatory
1993, December 22

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Comets in 1994

Comet	Prov. desig.	T	Brightest Mag.	Brightest Month	Brightest Elong.	Moon New	Moon Full
P/Schwassmann-Wachmann 1	-	1989 Oct.26.7	18(12)	Jan.	170W	Jan.11	
P/Kushida - Muramatsu	1993t	1993 Nov. 4.5	16	Jan.	145W		Jan.27
P/West-Kohoutek-Ikemura	1993o	Dec.25.3	12-13	Jan.	130W	Feb.10	
Mueller	1993a	1994 Jan.12.9	11-12	Jan.	45W		Feb.26
P/Schwassmann - Wachmann 2	-	Jan.23.9	11	Jan.	170W	Mar.12	
P/Spitaler	1993r	Jan.28.2	17	Jan.	95W		Mar.27
P/Encke	-	Feb. 9.5	7	Jan.	45E	Apr.11	
P/Kojima	1992z	Feb.18.0	15	Feb.	150W		Apr.25
P/Tempel 2	-	Mar.16.8	12?	Apr.	35E	May 10	
P/Maury		Mar.19.1	17-18	July	105E		May 25
Mueller	1993p	Mar.26.2	7	Apr.	60E	June 9	
P/Shoemaker-Levy 9	1993e	Apr. 1.3	14?	Apr.	c180		June23
P/Hartley 3	1993m	May 20.4	17-18	Jan.	100W	July 8	
P/Tuttle	1992r	June27.0	11	Aug.	30E		July22
P/Bus	1993b	June28.1	16-17	Mar.	170W	Aug. 7	
P/Reinmuth 2	1993g	June29.7	13	Sep.	135W		Aug.21
P/Kohoutek		June29.9	15	Sep.	35W	Sep. 5	
P/Tempel 1	1993c	July 3.3	9-10	May	135W		Sep.19
P/Wild 3		July21.2	15	May	170W	Oct. 5	
P/Harrington		Aug.23.2	12-13	Sep.	135W		Oct.19
P/Brooks 2		Sep. 1.1	12-13	Oct.	150E	Nov. 3	
P/Russell 2		Oct.27.4	17	June	150W		Nov.18
P/Borelly		Nov. 1.5	8-9	Dec.	125E	Dec. 2	
P/Whipple	1993n	Dec.22.4	15-16	Sep.	160W		Dec.18
P/Mueller 5	1993s	1995 Feb. 8.1	17	Dec.	100E		
(2060)Chiron(P/Chiron)		1996 cFeb.12	15-16	Feb.	180		
McNaught-Russell	1993v	1994 Apr. 1.4	11-12	Mar.-Apr.	60E		

Short-Period Comets at Perihelion in 1995

P/Comet	T 1995	q AU	P yrs	Previous Apparitions N	First	Last
Mueller 5	Feb. 8.1	3.95	14.39	-	1993s	-
De Vico-Swift	Apr. 9.5	1.93	7.32	3	1844I	1965VII
Finlay	May 5.0	1.04	6.76	11	1886VII	1988IX
Clark	May 31.2	1.55	5.51	4	1973V	1989XX
d'Arrest	July27.4	1.35	6.51	16	1678	1989II
Tuttle-Giacobini-Kresak	July28.6	1.07	5.46	7	1858III	1990II
Reinmuth 1	Sep. 3.3	1.87	7.31	8	1928I	1988VI
Schwassmann - Wachmann 3	Sep.22.7	0.93	5.34	3	1930VI	1990VIII
Jackson-Neujmin	Oct. 6.6	1.38	8.24	4	1936IV	1987VIII
Longmore	Oct. 9.3	2.40	6.98	3	1974XIV	1988XVIII
Perrine-Mrkos	Dec. 6.0	1.29	6.77	5	1896VII	1968VIII
Honda- Mrkos - Pajdusakova	Dec.25.9	0.53	5.27	8	1948XII	1990XIV

N = Number of observed apparitions.

LOST PERIODICAL COMETS.

Alex Vincent.

A number of periodical comets are lost either due to disintegration or perturbations by a giant planet such as Jupiter and also other reasons. Some have only been seen once and others for a few returns before having been lost.

Lexell's comet is a classic example of a lost comet which came very close to the Earth in 1770. It had a period of 5.5 years, but a perturbation by Jupiter had put the comet in a different orbit and now comes nowhere near the Earth.

On the other hand Comet Biela which was discovered in 1772 has disintegrated and at its return in 1845, it was seen in two parts. In November 1872 when the comet was predicted to return, a splendid meteor shower was seen which was the debris of the dead comet. The shower is now weak.

Several lost comets have been found and one is Comet Taylor which was discovered in 1916 and had a period of 6.4 years. It was thought to have disintegrated because it divided into two parts and was regarded as lost. In 1976 it was recovered after 60 years and made nine revolutions of the sun (without being seen) since its discovery. Its period is seven years.

My main attention concerns two periodical comets "Pons-Gambart and De Vico" which were seen only on one appearence. Comet Pons-Gambart came to perihelion in June 1827 and has a period of 57.5 years and that of Comet De Vico in March 1846 and has a period of 76.3 years.

Comet Pons-Gambart should have come to perihelion twice since its last appearence in the years 1884/85 and 1942. That of Comet De Vico only the once in 1922. Neither of them were recovered at these returns at all.

These two comets are presumably lost, but perhaps they came and went unnoticed at their subsequent returns and are now making a comeback. I predict that they will be seen again towards the end of the century. I predict a perihelion for Pons-Gambart between 1999 and 2000 and that of De Vico between 1997 and 1999 (possibly 1998).

The orbital elements for both comets at their last recorded returns are as follows.

P/COMET PONS-GAMBART 1827 II

T = 1827 Jun 7.6376	Peri = 19.950
q = 0.806508	Node = 319.3346
e = 0.945838	Incl = 136.4548
P = 57.5	

P/COMET DE VICO 1846 IV

T = 1846 Mar 6.0446	Peri = 12.8995
q = 0.663802	Node = 79.0127
e = 0.963099	Incl = 85.1128
P = 76.3	

T = Perihelion date. q = Perihelion distance in Astronomical units (AU). e = eccentricity. P = Period of revolution. Peri = Argument of perihelion in degrees, equinox 1950.0. Node = Longitude of the ascending node in degrees, equinox 1950.0 and Incl = Inclination in degrees, equinox 1950.0.

SOME THOUGHTS ON THE FUTURE OF COMET V-Photometry - Giant binoculars or CCDs?

(G Keitch, Foxworthy Barn, nr Manaton, Dartmoor National Park, South Devon. 1993 Sep 30)

With an increasing number of amateurs in various observational fields now using CCD technology to good effect, I have spent some time of late pondering on the future of gathering visual or V magnitude data for comets. I have decided to continue with pure visual work and have acquired larger binoculars to extend the range over which faint comets can be observed without recourse to much higher magnification telescopes.

Giant binoculars

Not so long ago, giant binoculars sounded more attractive for astronomy than they really were. With a few exceptions, the only models that could be obtained with OGs greater than 80mm were ex-World War II. Although I have only occasionally used such an instrument, I would guess that most surviving examples are probably not much better than my modern pair of multi-coated Zeiss 10X50B. The optics of these old binoculars have generally deteriorated and are often etched with fungi and while they might be vaguely bloomed, the images will not compare in clarity with those obtainable with today's multi-coated instruments.

The modern and affordable 80mm binoculars which first became available in quantity during the early eighties were a great step forward and were quickly adopted by comet observers both here and in the States. The value of small binoculars in allowing brighter comets to be seen to best advantage was quickly recognised and the off-the-shelf 80mm models merely extended this capability. Whereas larger telescopes (and hence correspondingly higher magnifications) had to be deployed once the typical comet had dropped below 8m, the new 80mm binoculars meant that comets could now be followed down to 9m and below. This resulted in brighter and more accurate photometry.

While the first batch of 15 and 20X80B were far from perfect, they did the job and in recent years their quality has improved. Most are now multi-coated. More recently, Vixen 100mm binoculars have become quite readily available and while the purist would find fault with them, I must say I am very pleased with mine. They are optically far superior to my previous Swift 20X80B (which I hadn't expected) and are consistently good for comets down to 10.5-11.0m. The large binoculars tend to come in for some unfair criticism. True enough, my 20X100B would be pretty awful at X150 but as a comet observer, I would not choose any other power than X20 - at which magnification, they give quite acceptable images.

All this has led me to believe that a modern (as opposed to ex-war) 125 or 150mm binocular would be even better. Unfortunately, those extra few mm of glass if they come from the Nikon or Fujinon factories takes the price from around £1000 (the approximate cost of 20X100Bs) to something between £5000 and £12000!

A number of suppliers are predicting the availability of cheaper Russian 110, 130 and 150mm models but they appear to be stranded in the Russian ports. There are also other possibilities. Chris Garvey at Countryside Optics will do a 150mm mirror-binocular for around £2000 and he claims these to be better than the object-glass variety at this aperture. He might well be right, especially if one considers value for money.

As luck would have it, while preparing this note I got a call from Broadhurst Clarkson and Fuller to say they had just acquired a second hand pair of Fujinon 25X150B minus stand and "would I like them?". Once I was assured they were in good condition, I didn't hesitate; only later did I give due consideration to such practical matters as getting them insured and delivered to Devon and building a stand for them! However, things are quickly taking shape. The 0.3m reflector, which had just been refurbished and given a new lease of life, suddenly lost it's altazimuth mount which a neighbour is now modifying for the giant binoculars. I expect to turn them towards Comets Mueller and P/Ashbrook-Jackson within a week or so.

Giant binoculars do have their drawbacks for comet photometry. The lack of a central focusing wheel to enable both eyepieces to be defocussed to the same degree simultaneously is a particular problem. (Who else would want to do that apart from the visual comet observer carefully exercising the I-O, Bob or Mor methods!?) I am assured by an engineering friend that this is easily resolved by using a combination of gears and chains! I had rather hoped the eyepieces on the Fujinons would click as they are rotated so that by counting the clicks one could defocus each eyepiece by the correct amount and then return them to the original focus position. Unfortunately, this isn't the case so I shall have to read-off from the scales marked on each ocular. With a little thought, I'm sure there are a number of solutions to improve on this.

An unexpected problem is the lack of eyepiece travel which means the binoculars cannot be defocussed very far. They will cope with comets up to about 3' dia which is adequate for the majority of 10.5-12.5m objects although I would prefer not to have this limitation. This is more likely to be an occasional nuisance than a serious problem. Again, this could be solved although I would rather not attack the Fujinons with a hacksaw to insert a slender collar to separate the objectives and oculars by an extra few mm!

Despite these two limitations, I have no regrets in going down this route. I have yet to observe a comet with them but a brief scan of the sky the other night produced some amazing views. Numerous writers have commented on the fact that binocular is superior to monocular vision although most have attributed this to aesthetic rather than genuine physiological reasons. It may vary amongst individuals although for me, working at the extreme limits of light levels and contrast, I would use binoculars every time. I estimate that a 150mm binocular system would be good for comets down to around 12m and I hope to be able to confirm this before too long. For very small faint comets there is no doubt that larger telescopes come into their own although there is a distinct possibility that an object seen as being only 1' dia and 12m.5 in the 30cm reflector at x62 might appear nearer 2' dia and 12m in a 25X150B.

CCDs

In my quest to extend the magnitude range over which I am able to measure cometary brightness with low magnification binoculars (and by telescopic standards, I include the X25 giants in that category), I have also been watching developments in the use of CCDs.

An increasing but still very limited number of observers are turning their CCDs towards comets for photometry. Without wishing to cast doubt on the new technologies, there is still a long way to go. Results from one or two lone experimenters are very encouraging but the lack of data is probably not providing a true picture. If several dozen CCD observers all tackled the same comet, I strongly suspect we would see just as much scatter and inconsistency as has given visual comet work a bad name in the past. Properly defined standards for instrumentation, exposure, reduction and processing techniques could make all the difference.

I am hopeful that in the near future, good CCD photometry will prove that the best binocular observations were not too far off the mark! On a number of recent occasions I have detected a comet with my 20X100B (admittedly in very good skies) and found it to be very much brighter and bigger than reported by users of larger telescopes - and much closer to the occasional CCD V-mag I have seen reported.

Conclusion

I have decided to continue with the visual work as one could argue that in order to make the transition to CCDs (and I believe it will happen) there is an even greater need to make good visual estimates now. This will enable us to build up a clearer picture of the relationship between the two disciplines.

I would be keen to enter into discussions with CCD users to see if we can start to define standards and look at correlations between pure visual and electronic detection methods. This could form the basis of a project within the BAACS and I would be interested to hear the views of others. I would also be very pleased to hear of any ideas to overcome some of the defocussing limitations with the giant binoculars.

Alcock 1963 b: The third comet discovered by George Alcock, who still remembers the circumstances - it was all thanks to the Peterborough football club who switched on their new stadium floodlights and forced him to observe at 3 am the following morning. I typed in the observations from the section archives whilst on my latest trip to the Antarctic. Although magnitude parameters are given, the comet shows a dramatic outburst after perihelion.

Kobayashi-Berger-Milon 1975 h: A well observed comet which has not yet been fully analysed. This was a well behaved 'Oort' comet with magnitude parameters close to the average.

Levy 1990 c: I am in the process of analysing the observation and hope to produce a report for the Journal in due course. This was rather brighter than the average 'Oort' comet, and there is some evidence for it fading a little after perihelion.

Shoemaker-Levy 1991 a1: Fairly well observed from the UK in June and July 1992. The value for K1 is about half the average.

Zanotta-Brewington 1991 g1: Another comet with a rather flat light curve.

Tanaka-Machholz 1992 d: The comet had a major outburst in May 1992 during the full moon period. No magnitude parameters have been calculated.

P/Swift-Tuttle 1992 t: Brightens very rapidly as it approaches the sun. A full report for the Journal is being produced by Martin Mobberley.

P/Schaumasse 1992 x: Proved rather difficult to observe because of its very diffuse nature. The published values for the parameters are H1=7.0 and K1=30.0.

The Comet Section

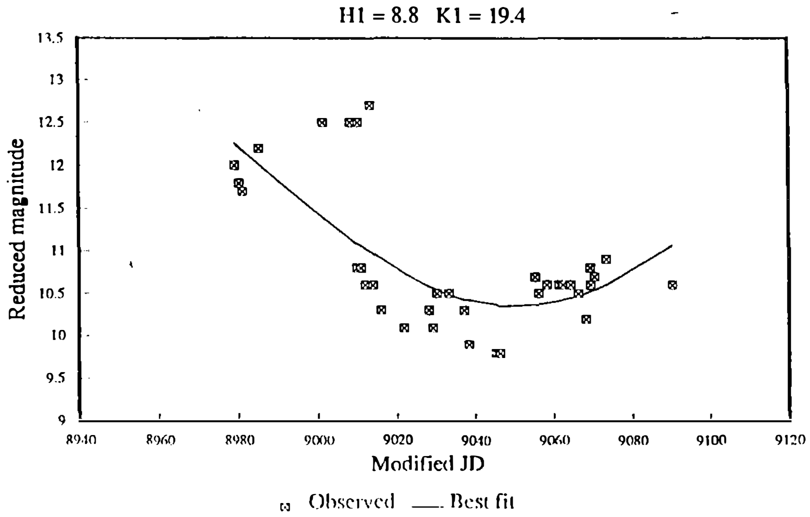
The light curves have been compiled from recent observations submitted by section members to the Director and TA and from the section archives. These observations have been sent to the ICQ, but there are still a lot more in the section archives which need entering onto computer. Volunteers please contact the Director!

Magnitude parameters H1 and K1 have been derived by fitting the observations to the equation

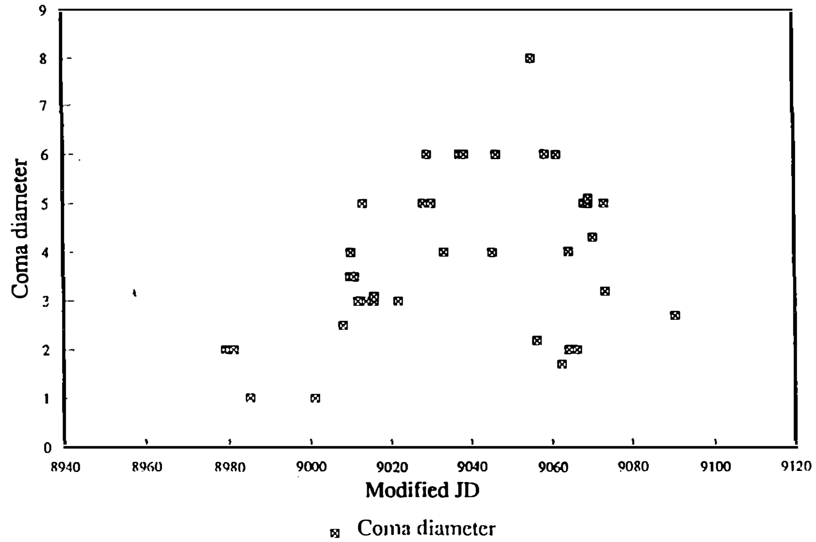
$$m = H1 + 5 * \log (Delta) + K1 * \log (r)$$

where m is the observed magnitude, Delta the distance of the comet from the Earth and r the distance of the comet from the Sun. The reduced magnitude is the observed magnitude corrected for the distance of the comet from the Earth and the modified JD is the number of days since an arbitrary date in 1968. An average comet has H1 = 7.1 and K1 = 10.0 (ie it brightens according to an inverse fourth law). If K1 is greater than 10 it brightens more rapidly as it approaches the sun, a value of 5 would imply simple reflection of sunlight and values smaller than this imply effective fading.

P/Schaumasse 1992 x



Comet P/Schaumasse 1992 x



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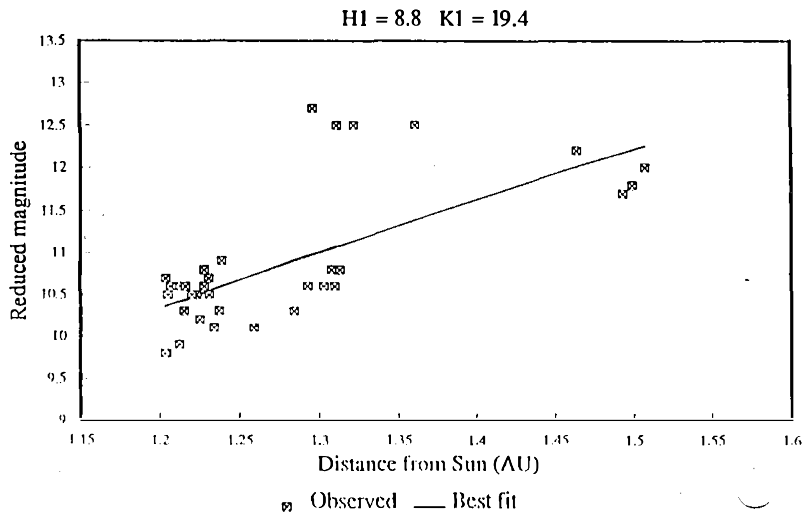
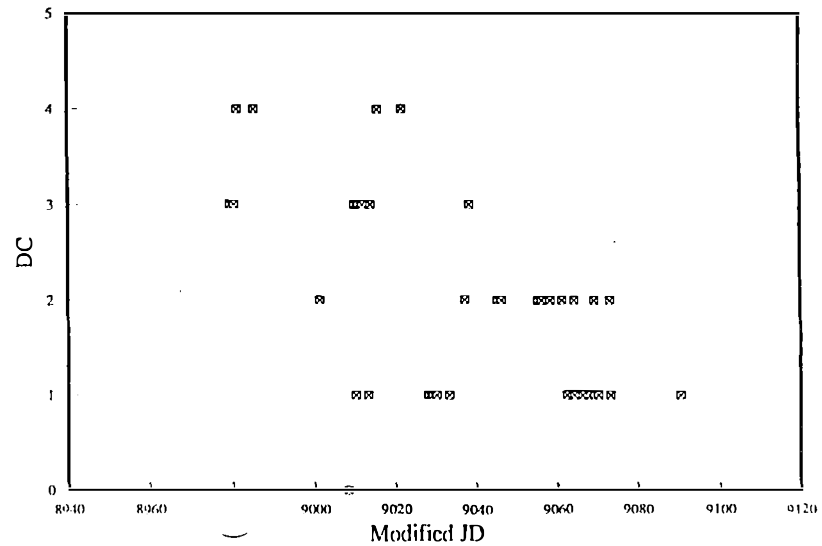
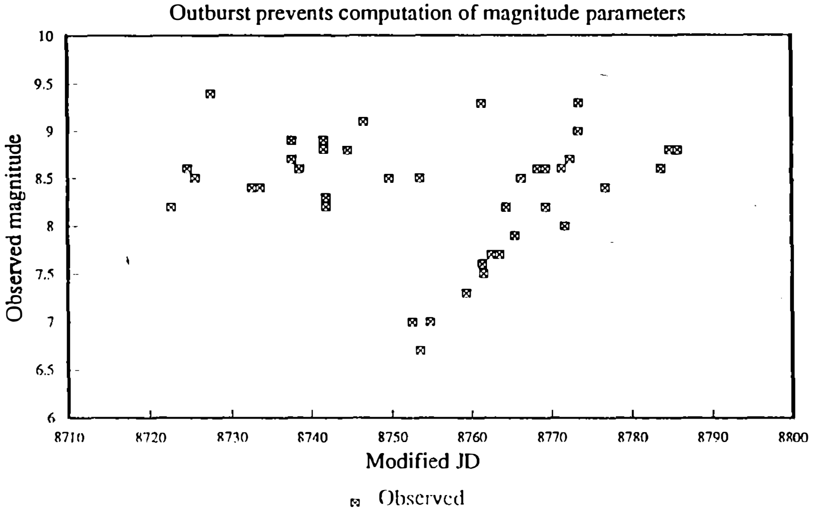


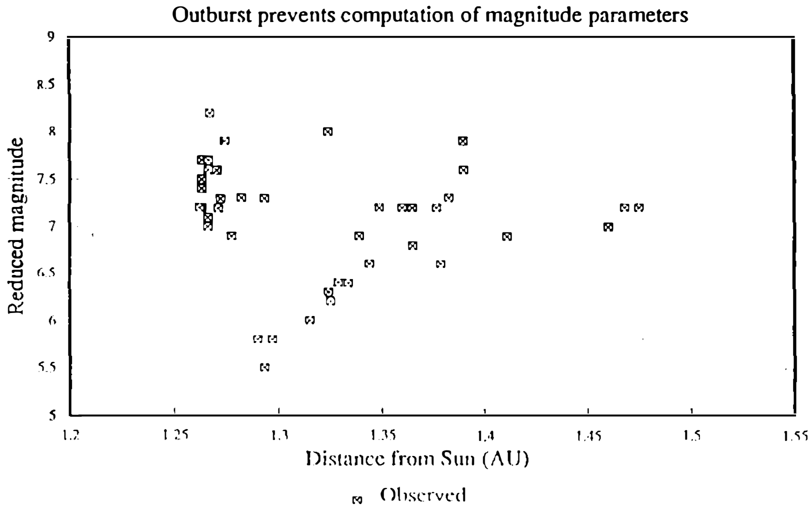
Comet P/Schaumasse 1992 x



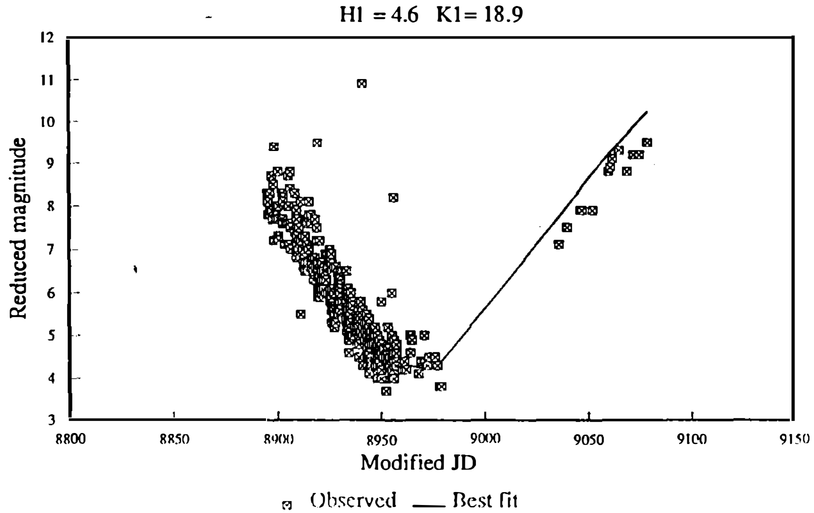
Tanaka-Machholz 1992 d



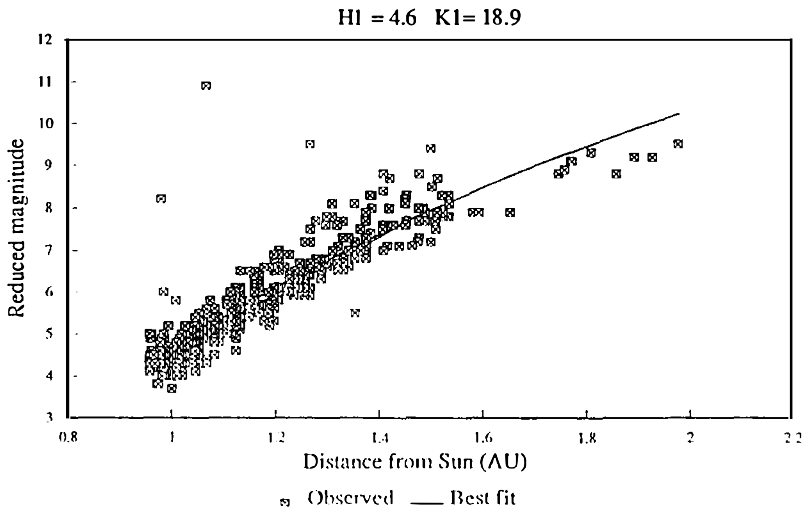
Tanaka-Machholz 1992 d



P/Swift-Tuttle 1992 t

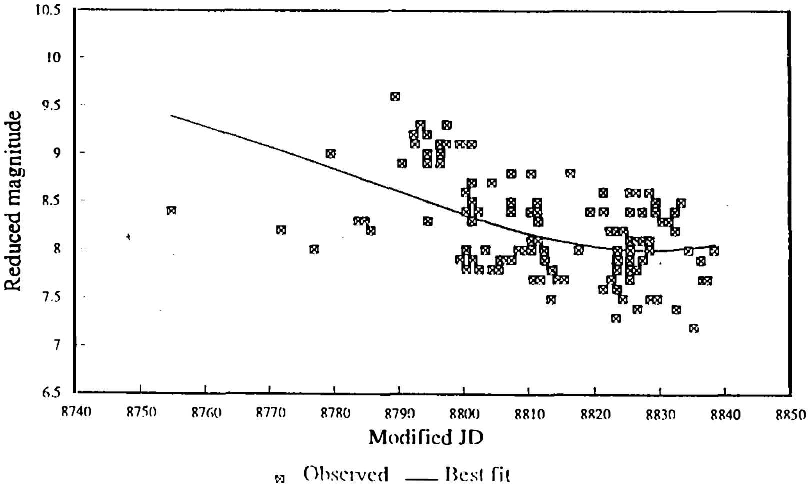


P/Swift-Tuttle 1992 t



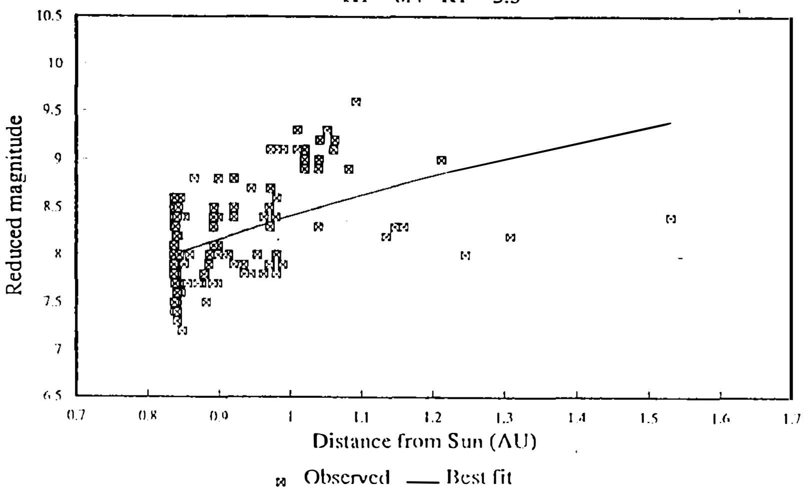
Shoemaker-Levy 1991 a1

H1 = 8.4 K1 = 5.3



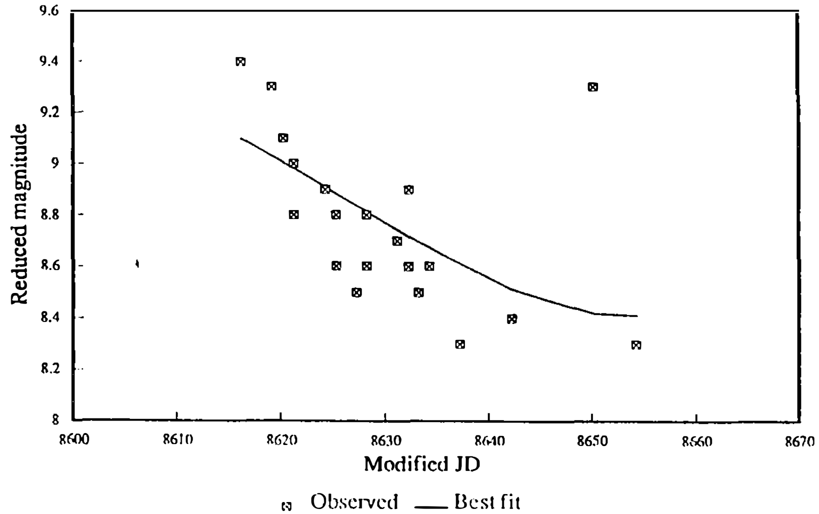
Shoemaker-Levy 1991 a1

H1 = 8.4 K1 = 5.3



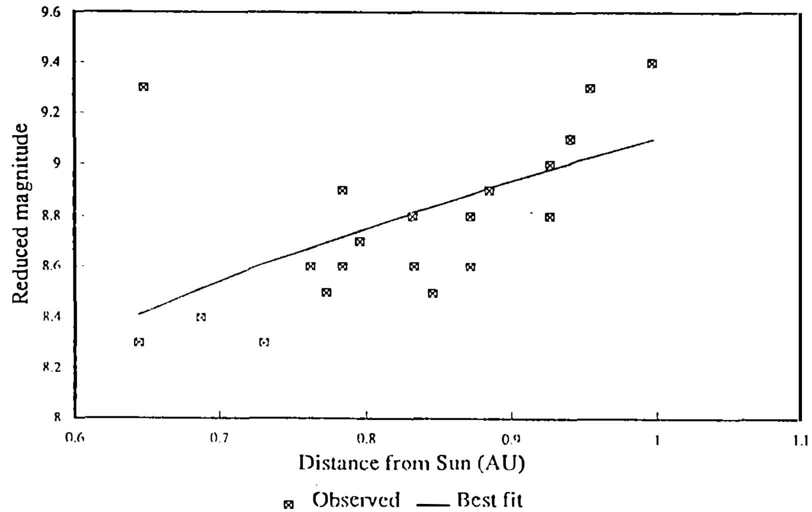
Zanotta-Brewington 1991 g1

H1 = 9.1 K1 = 3.6



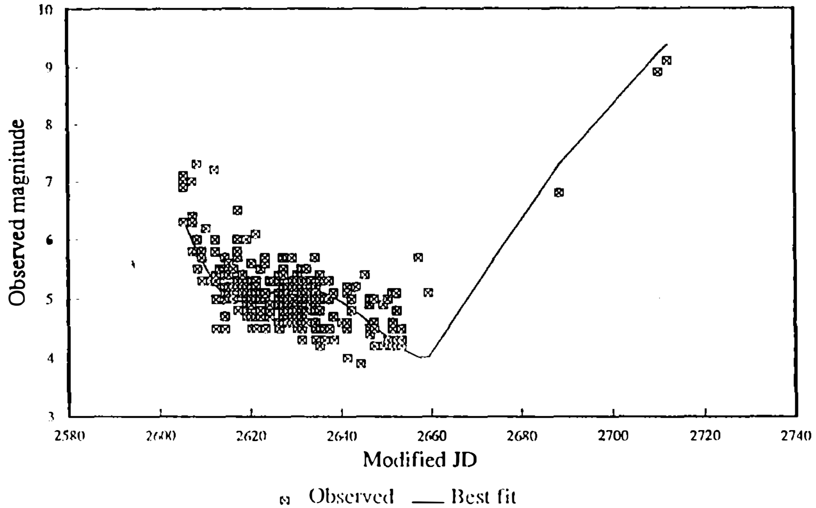
Zanotta-Brewington 1991 g1

H1 = 9.1 K1 = 3.6



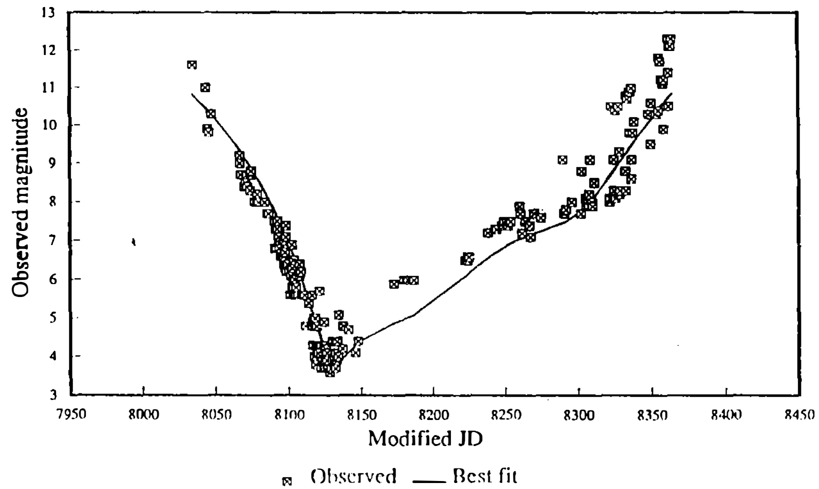
Kobayashi-Berger-Milon 1975 h

H1 = 7.4 K1 = 10.0



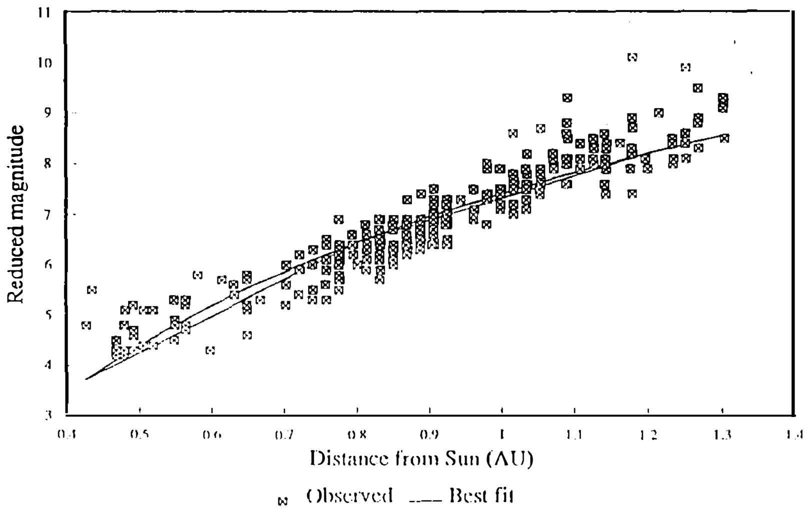
Levy 1990 c

H1 = 4.3 K1 = 10.0



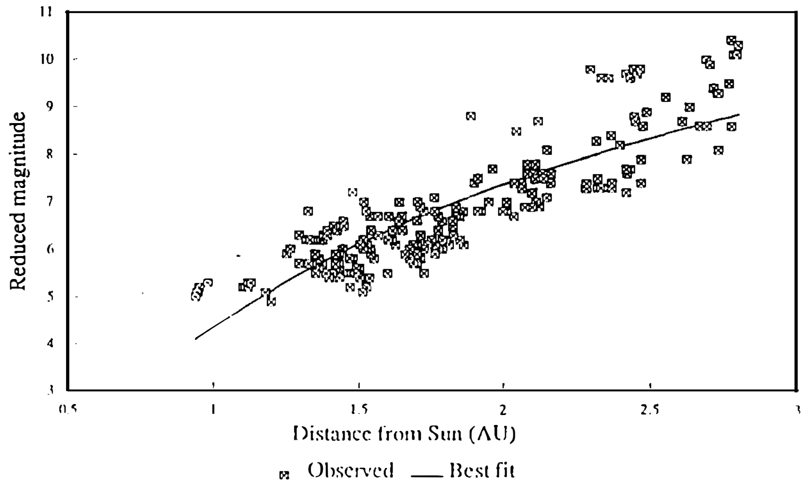
Kobayashi-Berger-Milon 1975 h

H1 = 7.4 K1 = 10.0

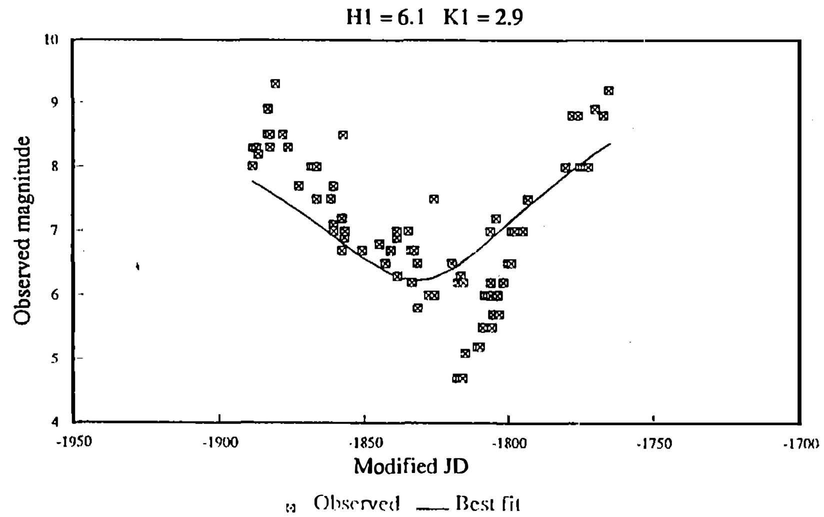


Levy 1990 c

H1 = 4.3 K1 = 10.0



Alcock 1963 b



Alcock 1963 b