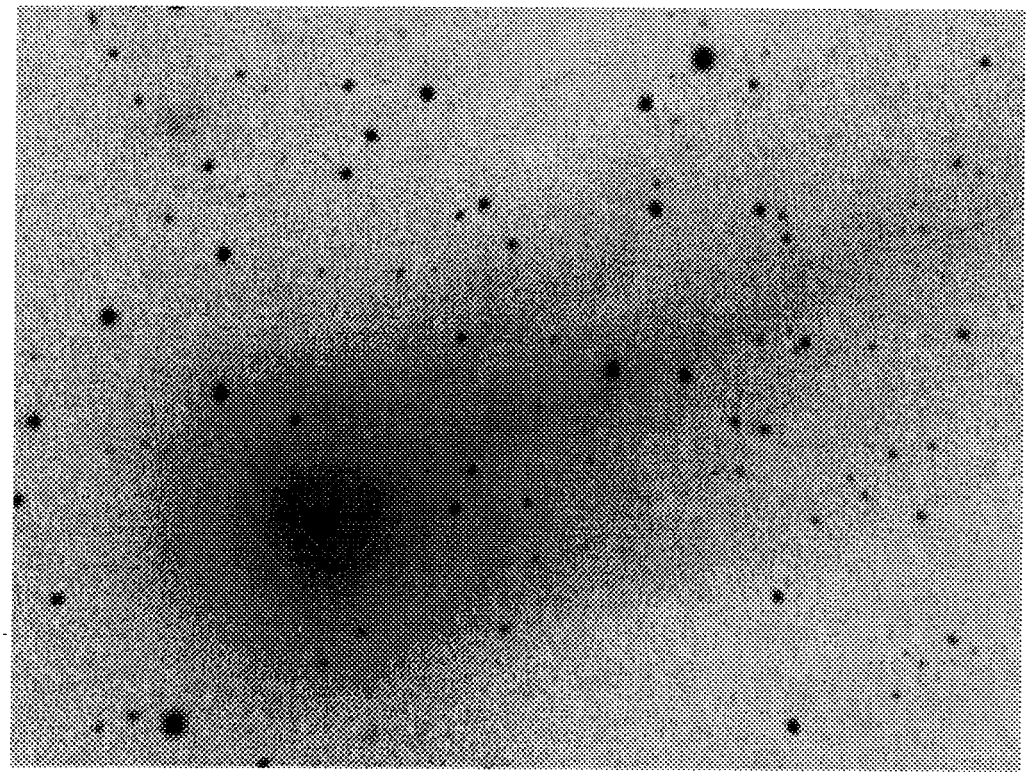
INTERNATIONAL COMET QUARTERLY

Whole Number 93 JANUARY 1995 Vol. 17, No. 1



CCD image of Comet P/1994 P1 (Machholz 2) taken with the 65-cm $f/3.6$ reflector (+ SBIG ST-6 CCD) at the Ondřejov Observatory on 1994 Sept. 4.072 UT (60-sec exposure through clear filter). Component B (situated in the upper left corner) was discovered on this frame, which spans 12′.7 × 9′.6 (north is up and east is to the left). Courtesy Petr Pravec.

SMITHSONIAN ASTROPHYSICAL OBSERVATORY
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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*.

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This issue is No. 93 of the publication originally called *The Comet* (founded March 1973) and is Vol. 17, No. 1, of the *ICQ*. *[ISSN 0736-6922]*

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— From the Editor —

The new designation system for comets is coming into place as this issue is going to press, and we will use the new designations (beginning with this issue) along with "old-style" (O.S.) designations for all *ICQ* issues during 1995, to help readers adjust to the new system. Change is often difficult to accept, but I think that this change is a very welcome one, and users of the new system will adapt readily. Brian Marsden (Director of both the International Astronomical Union's Central Bureau for Astronomical Telegrams and the Minor Planet Center) gives some timely historical background concerning cometary designations, beginning on page 3.

Pages 10 and 11 contain further information to aid contributors of data in using the new designation system, and we have taken this transitional opportunity to add a couple of new items to the tabulated data. Pages 43-44 contain the complete list of numbered short-period comets, followed by a list of the last 30 comets to have received letter designations in the old system (with one-to-one correspondence given between new and old). The tenth edition of the *Catalogue of Cometary Orbits* will be issued early in 1995 and will include a complete list of the new-style designations vs. the old; for further information, contact the Minor Planet Center, M.S. 18, Smithsonian Observatory, 60 Garden St., Cambridge, MA 02138, U.S.A. (e-mail IAUSUBS@CFA.HARVARD.EDU).

We have learned of the deaths in November of two men familiar to *ICQ* readers: Michael Candy of the Perth Observatory, past director of the B.A.A. Comet Section and discoverer of comet C/1960 Y1 (O.S. 1961 II) and recoverer of three periodic comets, on Nov. 2; and J. U. Gunter, editor of *Tonight's Asteroids* (which included notes and ephemerides on fairly-bright comets), on Nov. 14. — *D. W. E. Green* [1994 Dec. 28]

New Designations For Old

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Abstract. The motivation for the new system of comet designations is discussed, as are examples of its use.

Introduction

Over the past decade or so, it has steadily become apparent that changes were necessary in the system for designating and naming comets. Changes in the designation system were approved at the meetings of the International Astronomical Union in August 1994 and will become effective at the beginning of 1995. In order to appreciate the value of these changes, it is helpful to understand something of the history of the problem.

In ancient times, when comets were necessarily naked-eye phenomena that appeared at intervals of several years, it was reasonably straightforward to keep track of them simply by noting the years of their appearance. Occasionally a particular year would produce more than one comet, but that caused little additional complication. This impersonal tradition continued for the better part of a century following the first telescopic discovery of a comet in 1680.

It was Messier's attempt—unsuccessful, as it turned out—to be the first person to see the comet predicted by Halley to return in 1758 that led to comet hunting as a sport and to the concept of "comet discoverers". In the case of Halley's Comet, the "discoverer" was in fact the person who had established the comet's periodicity, and this same principle was applied to the comets named for Lexell and Encke. In general, however, the discoverer was defined as the first person actually to *see* each comet. The King of Denmark's inauguration in 1831 of a gold medal for the "first" discoverer of each comet provided an international incentive for identifying the person correctly, a process that could take a year or more, given the primitive communications of the time. As a result, comets came almost to be considered the personal property of their discoverers, as the *Monthly Notices of the Royal Astronomical Society*, for example, listed them as "Brorsen's third comet", "de Vico's sixth comet", and so on.

Astronomische Nachrichten

The Danish medal was awarded through 1846, a year that produced what was then a record seven cometary discoveries. In order to cope with this influx, the leading source for announcing the discoveries, the *Astronomische Nachrichten*, decided to designate the comets of a given year with Roman numerals to indicate the order in which they passed their perihelion points. Of course, one cannot rely on comets to show themselves to their discoverers in the same order they choose to pass perihelion, and it became customary to keep *altering* the designations as new comets were fitted into the perihelion sequence. Periodic comets were so recognized when they were observed to return, and they in particular came to be associated with the names of their observational discoverers.

The inconvenience of the unstable assignment of Roman numerals was eventually remedied by initially designating comets with lower-case letters indicating the order of discovery in each year. These designations were generally defined from the beginning of 1870, although two later entries were shown from 1869. Incidentally, both the letters and the Roman numerals generally *preceded*, rather than followed, the year. At the same time the name of the discoverer was frequently (but not consistently) placed in parentheses following the designation. There was almost invariably only one name per comet, except that the curious case of comet 1877c = 1877 III was usually listed as "1877 III (Swift, Borrelly, Block)"; it shows in the 1994 edition of the *Catalogue of Cometary Orbits* as "Swift-Borrelly-Block", one of only two single-apparition, triple-named comets prior to 1930.

The first cases of numerals appended specifically to the names of periodic comets were for those comets we now know as P/Tempel 1, P/Tempel 2, and P/Tempel-Swift, the first two actually being listed in the *A.N.* as "Erster Tempel'scher Comet"and "Zweiter Tempel'scher Comet", and the third then invariably as "Tempel$_3$-Swift". The idea was that the Leonid comet of 1866 should become the "Vierter Tempel'scher Comet" on its return in 1899, but it was not actually observed to return until 1965, by which time the convention for numbering comets had gone through several more variations.

Although other authorities continued to use them, the influential *A.N.* ceased using the letter designations after the end of 1881 and reverted to the changeable Roman numerals of the past—although often only the year and name were given. A few years later, the *A.N.* was consistently indicating the unavailability of Roman numerals with an ellipsis, e.g., "1885 ... (Barnard)". In quick succession there then appeared comets "1886 ... (Brooks 1)", "1886 ... (Brooks 2)", and "1886 ... (Brooks 3)", which later took the Roman numerals 1886 V, III, and IV, respectively. The comet thus known later as "1886 IV (Brooks 3)" is in fact the one currently called P/Brooks 1, while the current P/Brooks 2 is a comet not discovered until 1889, by which time Brooks had discovered two other comets. The first of these (1887 II) was introduced as comet "1887 ... (Brooks Jan. 22)" in a system that was used rather consistently with discoverers and discovery dates until the end of 1898. Rare cases of multiple discoveries were denoted with hyphens, e.g., "1886 IX (Barnard-Hartwig)".

For returning periodic comets, name and designation were inverted and parentheses removed, e.g., "Encke'scher 1891 III", while the first recovery of what we *now* call P/Brooks 2 was indicated as "Brooks (1889 V) 1896 ...", later becoming "Brooks (1889 V) 1896 VI".

The *A.N.* reintroduced the letter designations at the beginning of 1899, this time with the letter following the year, but by 1902 names were not being indicated (except for returning periodic comets). Names then started reappearing, particularly for periodic comets, generally again parenthetically, but without parentheses for the multiple-apparition comets. A rather curious system of parentheses and commas would allow simply "1907 V", or occasionally "1907 V (1907e) (Mellish)" or, more rarely, "1907 V (1907e Mellish)" for an older non-periodic comet; "1906 IV (Kopff)" for a one-apparition periodic comet; and "1906 V, Finlay'scher" for a return of P/Finlay. If Roman numerals were not available, these were given as in "1909a (1909 ...) (Borrelly-Daniel)" and "1909c (1910 ...), Halley'scher".

IAU Circulars

In 1920 the IAU Central Bureau for Astronomical Telegrams was established in Brussels, and on its move to Copenhagen in October 1922, the present series of *IAU Circulars* was initiated. As in the *A.N.*, the early *IAU Circulars* generally recorded comets by designation, the names being parenthetical. One reason for this was that the responsibility for providing the designations, both for comets and minor planets, remained in Germany. Often the IAU Central Bureau had to announce a comet or unusual minor planet without having a designation for it. In such a case the publication on an *IAU Circular* would be simply under a heading like "Object Baade" or "Comet Wolf". When, around 1925, the IAU *did* take on the responsibility for the cometary letter designations, it therefore continued this practice, adding the *designation* parenthetically.

At its return in 1925, the *IAU Circulars* denoted Brooks' comet 1889 V as just "Periodic Comet Brooks", although Crommelin's comet catalogue of that year listed it as "Brooks (2)" (copied by some as "Brooks II"); the numeral was not widely applied until 1946, and the parentheses were later eliminated. Crommelin also made other changes, such as replacing "Periodic Comet Winnecke" by "Periodic Comet Pons-Winnecke".

As photographic discoveries of comets became common, often with a team of astronomers working together, comet names like "Schwassmann-Wachmann" began to appear, and in 1930 "Peltier-Schwassmann-Wachmann" (or sometimes "Schwassmann-Wachmann-Peltier") became the first genuine triple name. The three-name limit was first imposed with comet Jurlof-Achmarof-Hassel in 1939, and Bappu-Bok-Newkirk in 1949 was the first triple name involving astronomers at a single site.

The "P/" notation for periodic comets was introduced in the 1940s, and as the same few photographic observers tended to discover more than one periodic comet, numerals came to be added to the names of such comets as soon as it was shown that their computed revolution periods were less than 200 years. This was often done in retrospect, with no attention paid to cases where the earlier policy might have indicated—indeed, *did* indicate in some publications—different numerals (viz., the unnecessary and confusing P/Barnard 1, P/Barnard 2 and P/Barnard 3, the switch between P/Neujmin 1 and P/Neujmin 2, the decision to introduce the name P/Tempel-Tuttle rather than the intended P/Tempel 4, etc.). As more and more comets have been discovered, the same troublesome practices, never officially endorsed by the IAU (it seems), have continued. The one "success" of this maze of appended numerals is that, rather surprisingly, in the "finally adopted set" a complete sequence 1, ..., n is still extant for each case of duplication of the name of a periodic comet.

Complications in recent decades have been the occasional indecision as to whether an object is a comet or a minor planet, and the need to interpolate past comets into the system. Thus comet 1939b = 1939 IV P/Väisälä 1 was originally known under the asteroidal designation 1939 CB, while comet 1977t was later redesignated as asteroid 1977 YA. In any case, the breakdown of international communications during World War II caused the letter designations again sometimes to be dropped—and on other occasions the letter designations used in North America were different from those used in Europe. The 1966 publication of a discovery of P/van Houten on the plates of the Palomar-Leiden Survey caused this comet to be given a designation, 1961 X, that placed it at the *end* of the list of comets passing perihelion that year, even though this comet was actually at perihelion between 1961 IV and 1961 V. No letter designation was given to this comet, and indeed, when it comes to interpolating old comets the letter-designation system has remained inviolate—which means that comets whose existence has been confirmed on the non-simultaneous blue and red exposures of the Palomar Sky Survey, but that were not well-enough observed for orbit computations to be made, could not receive any designations at all!

And triple-barreled names proliferated. In recent years there has been some attempt to restrict comet names to two components (or even one), for "team" discoveries, sometimes with the use of a team name (Tsuchinshan, IRAS, Spacewatch) or "appellation" (as for the SOLWIND and SMM comets, where the names became parenthetical to the designations of these apparent Kreutz sungrazers, and numerals were added for convenience).

New designation system

So the main requirements of a new designation system are that comets recognized from the past could be easily and logically worked into the system, and that it would not matter if one could not immediately decide whether something were a comet or an asteroid. Furthermore, since letter designations have in recent times only very rarely been given to comets for which orbits can not be computed, there is essentially a 1:1 correspondence between the letter and Roman numeral designations, a redundancy that is surely unnecessary, given that the comets also usually have names. Finally, with the recognition of well over 100 multiple-apparition comets whose returns can generally be rather accurately predicted using modern computers (particularly when allowance is made for the nongravitational forces that affect the motions of

most comets in a rather systematic way), it seems unnecessary to acknowledge and designate a "recovery" *every* time one is observed to return to perihelion; in any case, when large telescopes are used, more and more periodic comets are observable all the way around their orbits.

The new system being introduced in 1995 accords to each discovery a designation consisting of the year of discovery, an upper-case letter to indicate the halfmonth during that year, and a numeral to indicate the order of discovery in that halfmonth. The halfmonth descriptors are identical with those used for minor planets, the difference being that for minor planets the sequence in a given halfmonth involves another letter, as well as a possible numeral (and for comets the numeral is not a subscript). Late announcements of discoveries made during earlier halfmonths can easily be accommodated. If a comet turns out to be a minor planet, or vice versa, the initial designations would be maintained. The prefix "P/" can still be applied to denote a periodic comet, and this is replaced by a "C/" to denote a comet that is *not* periodic. If a comet is designated but no orbit can be computed, the prefix would be "X/". If an object given a comet designation turns out to be an asteroid, it would receive the prefix "A/". If returns of a periodic comet are—for whatever reason—unpredictable, the "P/" can be replaced by "D/".

"Established" periodic comets are to receive permanent numbers in front of the "P/", in much the way that minor planets receive permanent numbers. This establishment will normally occur when a periodic comet is observed to make its next return to perihelion, at which time the recovery is acknowledged and a new designation supplied. Soon afterwards a sequential number is officially assigned to the comet, and future recoveries will then be recorded as such only if a comet is lost for a substantial interval of time, or if the revolution period is in excess of, say, 50–60 years. These numbers can also be given to cases where periodicity is established by linking observations at different apparitions of a comet, or where a comet is observed through aphelion. Although mixing of cometary and asteroidal designations is not a problem, it has been thought desirable to give periodic comet numbers as an *alternative* when an object deemed to be a comet has previously received a permanent asteroid number. Thus (2060) Chiron can *also* be denoted as 95P/Chiron and (4015) Wilson-Harrington as 107P/Wilson-Harrington. Some of the numbered comets, like 3P/Biela and 5P/Brorsen, are now lost and evidently defunct, so they are instead denoted 3D/Biela and 5D/Brorsen. For the unnumbered periodic comets it is anticipated that the "P/" will be converted to a "D/" even more frequently, e.g., for all cases where the period is longer than 50–60 years or when several returns have been missed since discovery.

Although no changes are currently being made in the system used for *naming* comets (i.e., comets will still generally be named for their discoverers), some additional formality will be introduced, causing the names proposed for comets to be approved by a committee, a procedure that is usually expected to produce only minimal delays, with a name generally being available by the time the first orbit is computed. The names will again be parenthetical to the designations, because it is the names that can logically be omitted. It is possible that the naming system will be modified in the future in the interests of fairness and simplicity. For example, there could be increased use of team names when several people are involved in making a discovery, and comet names might be restricted to a maximum of two components, rather than three. Furthermore, since the numbers preceding the "P/" uniquely define the established periodic comets, one might consider dropping any numerals that *follow* the names. On the other hand some astronomers want to distinguish with appended numerals *all* comets, periodic or otherwise, having the same name—surely a step backward reminiscent of the system used in the *M.N.* in the 1840s!

Comets of 1994

New-style designations can and should be applied to pre-1995 comets, whenever possible. As an example, the old and new designations for the comets of 1994 are as follows:

1994a becomes P/1994 A1 (Kushida)
1994c becomes C/1994 E1 (Mueller)
1994d becomes C/1994 E2 (Shoemaker-Levy)
1994f becomes C/1994 G1 (Takamizawa-Levy)
1994h becomes P/1985 Q1 = 1994 J1 (Maury)
1994i becomes C/1994 J2 (Takamizawa)
1994k becomes P/1994 J3 (Shoemaker 4)
1994m becomes C/1994 N1 (Nakamura-Nishimura-Machholz)
1994n becomes P/1994 N2 (McNaught-Hartley)
1994o becomes P/1994 P1 (Machholz 2)
1994r becomes C/1994 T1 (Machholz)
1994u becomes P/1994 X1 (McNaught-Russell)

As it happened, five of the 11 new comets of the year turned out to be of short period, but this would not be initially known. Immediately after discovery, the comets would be simply "1994 A1", "1994 E1", etc., the "P/" or "C/" (or "D/" or "X/"), as well as the parenthetical name, being added later. It should be noted that 1994 J1 was a periodic comet making its first observed return, its discovery designation in 1985 also being recorded. As a separate step, this comet would then become "115P/1985 Q1 = 1994 J1 (Maury)", after which one or both (as appropriate) of the equated designations could be omitted, giving "115P/Maury" or even simply "115P". The form "115P/Maury" is the only one in which the name would *not* be parenthetical and is similar to what is done at present—although it must be noted that the "115" is *mandatory*—and allowance of "115P" (without the "/") suggests that the form "115P (Maury)" would also be acceptable. The other comets given letter designations (but not new-style designations) in 1994 are returning periodic comets that would already be known by their numbers and names (as given on *MPC* 24252 and on pp. 43-44 of

this issue of the *ICQ*). Comet P/1994 P1 (Machholz 2) and one of those established periodic comets, 51P/Harrington, were observed to split. These designations apply to the combined comets. The secondary components, for example, are to be referred to as P/1994 P1-B or P/1994 P1-B (Machholz 2), and 51P/Harrington-B or 51P-B, or conceivably 51P-B (Harrington), the rule being to apply the "-B" (or other letter) to the end of the unparenthesised part of the designation.

Why abandon current letter designations?

There is clearly widespread support for abandoning the Roman numeral designations. On the other hand, several people have wondered why the letter-designation system was not simply accepted as the new standard. While this course was certainly considered, it was felt that the letter designations had not been used in the past in a sufficiently uniform manner, and that the proposed changes in designation *policy* (termination of recognition of routine recoveries, need to interpolate old comets, etc.) were sufficiently far-reaching to warrant the use of a completely different system. Confusion between faint comets and asteroids is clearly going to become more of a problem in the future, so it seems reasonable that the systems for designating these classes of object should be similar. Some people have gone so far as to suggest that a *single*, uniform system should be used for *both* comets and asteroids. This course was not adopted because there is clearly some considerable difference between a bright long-period comet and a faint main-belt asteroid, and in any case, the comet designations are supplied by the CBAT and the asteroid designations by the Minor Planet Center.

It is hoped that readers will agree that the practice of designating and naming comets has become so convoluted and inconsistent that the proposed changes were indeed necessary. While the *A.N.* tried and in large measure succeeded to systematize procedures during the latter part of the nineteenth century, it is clear that the IAU has not until now shown the leadership it should in dealing with the different techniques for observing comets that have come along during the twentieth century and are likely to be used in the twenty-first. The new system differs quite drastically from the old, and it may take some time to get used to this. Computer files and programs will be have to be modified. The system is the outcome of a lot of discussion during the past three years, and it is no accident that in some aspects it represents a reversion back to what was done in the *A.N.* While the designation system has been set, some problems remain in connection with the way names are assigned to comets, and these may not be resolved before the next IAU General Assembly in 1997.

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Thoughts on Comet Hunting

Don Machholz

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Abstract. The author examines his successful project for discovering new comets, giving an overview of his results — nine comets he discovered that carry his name.

The Beginning

It was just 20 years ago — December 1974 — that I decided to pursue a systematic search for comets. This decision came at a pivotal time in my life. I had just finished serving three years in the military, had moved back home, and wanted a project that would encourage me to spend more time viewing the heavens. Over the previous decade, I had spent considerable time viewing all the planets and a half-dozen comets, had found every Messier object in one year (1969-70), and had photographed the skies. I have always enjoyed the view of the night sky through the telescope. The projects that I considered were variable stars, asteroid studies, and comet hunting.

Comet hunting seemed most appealing to me. I also knew that very few Americans were searching for comets, because most visual discoveries were being made from foreign lands. According to James Muirden (*The Amateur Astronomer's Handbook*), the average comet hunter took 300 hours to find a new comet. This was confirmed to me when I read an interview with William Bradfield appearing in the magazine *Eclipse*, in which Bradfield said that his first discovery took 260 hours and his second an additional 306 hours. My early philosophy thus developed: I would attempt systematic comet hunting for as long as I found it enjoyable. If I did not find it enjoyable, I could quit my comet-hunting program and move on to something else, my only "loss" being the time spent looking through the telescope. Finally, I wanted my comet-hunting program — as extensive as it might become — to be only a part of my life, not to consume it. I did not want to exclude other activities or people from my life just because I wanted to hunt comets.

The remainder of December 1974 was spent setting up my comet-hunting program and practicing under the night sky. I divided my sweepable sky into four sections — excluding dense, Milky-Way and galaxy-laden areas. (This lasted less than a year, when I then opened up the whole sky for sweeping.) The instrument that I used was an 11-cm $f/5$ reflector at 20×, sitting on a mount taken from my 15-cm Criterion Dynascope. Within a year, I transferred the 11-cm reflector to an equatorial (unguided) pipe mount.

Marking Time

An important decision that I made very early was to mark my progress in comet hunting by counting the number of hours that I spent sweeping, rather than the number of comets that I found, as one can spend a great deal of time hunting and not finding any comets — because there are none out there to be found or because others are finding them, factors that one cannot control. But I have some say over how many hours I spend sweeping. Being a goal-oriented person, I set goals of a certain number of hours per month. This has guided me through 20 years of comet seeking. I count only the amount of time that I actually spend looking through the telescope; this gives me accurate meteor and artificial-satellite hourly rates, since I count the number of these objects that I see while sweeping.

The least number of hours that I've spent in any one month was 4.50 in January 1986; the greatest number was 69.25 hours in May 1976. Yearly totals vary from 189.75 (in 1988) to 553.00 hours (in 1976). My average year yields 280 hours — approximately my current rate.

Instruments

Comet hunters generally agree that the instrument is not nearly as important as the person behind it. I have found that eyes, skies, and instruments determine what you see, and the comet hunter should try to improve all three of these factors. I started with that 11-cm reflector, but — thinking that a larger instrument would help me see fainter objects — I purchased a 25-cm $f/3.8$ mirror and built a reflecting telescope around it. When I started using the 25-cm reflector in 1975, it was one of the largest instruments in use anywhere for comet hunting; this has changed, as others are now using larger scopes, but my 25-cm is still my largest instrument.

In April 1983, I purchased two aerial-photography lenses rated at focal length 36 inches (914 cm) and $f/8$. Each consists of five elements, the front being a lens of 6.2 inches (157 mm). From these, I designed and built a pair of binoculars. Based in a plywood box, each lightpath consists of one aerial-photography lens, one 2.60-inch diagonal mirror, one 1.83-inch diagonal mirror, and a surplus eyepiece slipped into PVC pipe. The instrument cost less than $400 to build, and I've used it for more than half of my comet hunting since then. The contrast is good, and under moderate-light-pollution conditions it "sees" as well as the 25-cm reflector (though under darker skies, the 25-cm performs better), and I can sweep faster with two eyes than with one. It is mounted on a large altazimuth pipe mount.

The 25-cm reflector has gone through some changes, too. In 1981, I re-designed the tube, removing the focuser and using a pipe flange "sunk" into the side of the tube. This brought the eyepiece closer to the diagonal, so I reduced the size of it from 3.14 to 2.14 inches. I've used a few homemade eyepieces on this instrument; presently I'm using a 32-mm commercially-made Erfle with a "minus" lens at the end of the eyepiece barrel closest to the main telescope tube. This "Smyth" lens effectively increases the focal ratio of the primary mirror, thereby increasing magnification and contrast while sharpening images near the field edge.

In 1988, I built a 12-cm refractor out of an additional aerial-photography lens. Well-baffled and in a plywood box, a rotating turret allows me a choice of eyepieces. I most often use the 12-cm refractor at 20×, but seldom see much fainter than the Messier objects. It was used, however, for the discovery of comet C/1992 F1 (Tanaka-Machholz; old-style designation 1992d).

Mornings and Evenings

Seventy-three percent of my comet hunting takes place in the hours after midnight. Edgar Everhart's report (*Astronomical Journal*, August 1967) indicated that the morning sky should produce more comets than the evening sky. So I've spent more of my time there, and all my discoveries have been in the morning sky.

I plan observations for each lunar month. I'll start in the evening sky about three days after Full Moon. My intention is to sweep up to 6 hours in right ascension from the sun. As the week progresses, if the weather is good and I get a lot of time "in", I can begin covering the eastern sky before moonrise. As the waning moon reaches 40-percent-lit or less, I start sweeping the morning sky; I've determined that, under good atmospheric conditions, I lose only about a magnitude when the moon is that bright and also some distance away from my sweeping area. I found comet C/1988 P1 (O.S. 1988j) under such conditions.

After I've covered much of the morning sky — up to 8 hours in right ascension from the sun — I re-sweep these areas a few mornings later. Most other comet hunters may have swept here, but a comet undergoing a brightness outburst (or one simply missed by others due to a crescent moon) may be discoverable then. I found comets C/1978 R3, C/1985 K1, 96P/1986 J2, C/1992 N1, and P/1994 P1 (O.S. 1978l, 1985e, 1986e, 1992k, and 1994o) under such conditions.

There was a time that I swept only in the morning sky. For the first 18 months of my marriage (late 1979), I ceased all evening observations so that I could spend nights home with my wife.

Procedure

Whether I sweep with an altazimuth (binoculars) or equatorial (25-cm reflector) mounting, my sweeps are in only one direction. This prevents "underlap" (missing portions of the sky) at either end of the sweep. With a clock drive, or when covering polar or (due-)southern regions, bi-directional horizontal sweeps may be acceptable. With an altazimuthal mount, I sweep horizontally, first in one direction, then swinging back to the original azimuth before raising (western sky) or lowering (eastern sky) the instrument. The sweep length may be as long as 90°, but averages 45°-60°. With the equatorial mount, I sweep along the same right ascension (α), spanning declination ranges of 30°-40°. The shift in α is made at the end of the sweep closest to the celestial equator (otherwise, sections will be missed as one sweeps toward the equator).

A sweep takes 2-4 minutes. I keep the instrument in constant motion. Going too fast causes things to be missed, but slowing down takes up too much time. Searching high in the sky with the 25-cm reflector, I pick up most nebulous objects on the *Atlas of the Heavens* (galaxies to mag 13), and occasionally go beyond this limit. With the binoculars, where my average sweep elevation is 25°, I normally pick up everything brighter than mag 10.5, and often go deeper.

I keep extensive notes of where I've swept, how long it takes, and what I have seen. The list becomes long when I sweep the Virgo and Coma Berenices regions, which I do as much as any other area.

Locations

My early efforts at comet hunting were from my parents' backyard in Concord, California. I did not realize how much light pollution was affecting me until I tried hunting from a dark site. From November 1975 through September 1991, I was a commuting comet hunter. While living in Concord, I drove several miles to the newly-constructed Concord Pavilion and a new home-construction site nearby. After moving to San Jose in March 1976, I tried a few sites before settling on Loma Prieta in May 1976. From the side of a road, on the south side of the mountain, at 3300 feet (1200 m) above sea level, I spent the next 15 years searching for comets. This amounts to about 4000 hours and 1800 sessions, during which I found 3 comets.

My second comet was found from Big Bear, California, while I was attending the Riverside Telescope Maker's Conference on May 27, 1985 — the Monday morning after almost everyone else had left.

In October 1990, we moved to Colfax, primarily to transfer from two incomes to one (difficult to do), so that my wife could stay home and take care of our children; other reasons included finding a location with less congestion and darker skies. Our home was built in September 1991, but it was two more years before I built an observatory on our property to house my comet-hunting instruments.

A Decade of Comets

In the early 1980s, I wished to determine if comets are still being discovered as they were in the earlier days of astronomy. I conducted my own study of these comets, centered mainly on those found visually since I began searching for comets in 1975. As this study approached 100 pages, I saw how valuable this information would be to others and decided to make it available in book form. Entitled "A Decade of Comets — A Study of the 33 Comets Found by Amateurs Between 1975 and 1984", the study was self-published in 1985. It has since been translated into a few foreign languages and has been helpful to a few of our successful comet hunters.

The Comets

At this writing (mid-December 1994), I have discovered nine comets (see Table I). I have not independently discovered known comets shortly after discovery, mainly because I normally receive notice of comet discoveries very shortly after they are found. For most of my comet-hunting years, I subscribed to the telegram service of the IAU's Central Bureau for Astronomical Telegrams (CBAT) for learning of new comet finds. The CBAT terminated the telegram service in 1993, and for the past year I've used an old IBM 286 computer with modem to communicate with the CBAT, to obtain the *IAU Circulars* electronically.

I did, however, find one comet long after it was discovered. In November 1991, I picked up comet C/1991 B1 (Shoemaker-Levy; O.S. 1991d) in the morning sky and reported it to the CBAT; they phoned me back a couple of hours later, saying that it had been discovered earlier in the year, raced into the morning sky, brightened a bit, and had been generally neglected over the past few months.

I have swept over nearly a dozen comets that were later found by others. I missed them because they were too faint for me to see (this happened mostly from Loma Prieta), or because they later brightened shortly before discovery by others.

Two of my first four comets apparently disintegrated after rounding the sun. My first had a hyperbolic orbit and will never return. Comet 96P/Machholz 1, on the other hand, returns every 5.24 years and comes closer to the sun than any other known short-period comet. Three of my comets (C/1985 K1 = O.S. 1985e, C/1988 P1 = O.S. 1988j, and C/1992 N1 = O.S. 1992k) have short observational arcs and are still assumed to be in parabolic orbits.

I'll always remember discovering comet C/1985 K1 (O.S. 1985a) from Big Bear. Laura and I had a very difficult time contacting the CBAT: it was a holiday, phones didn't work, Western Union was unoperational. We finally got through.

Comet C/1992 F1 (Tanaka-Machholz) was found on 1992 March 31, the day before we were to drive to the Los Angeles airport to pick up our newly-adopted son from Korea. The following morning, the time when the comet is normally confirmed, found us on the road in southern California. I stopped along the freeway to try to confirm it, but was clouded out. I then called Dr. Marsden from a fast-food restaurant to learn that it had been confirmed and named.

Comet P/1994 P1 (Machholz 2; O.S. 1994o) seemed to be full of surprises. First, it turned out to be periodic, returning every 5.23 years. Then it experienced an outburst in brightness. Next, little comets were found nearby, indicating recent splits. Finally, there were rumors in the media that it might someday hit the earth!

Conclusion

I continue to enjoy searching for comets and hope to do so for as long as I can. I have no idea how many comets will come my way. If none do, I will still enjoy searching for them. Life, including my comet work, has been good to me, and no one is more thankful for that than me.

TABLE I. COMETS DISCOVERED BY DON MACHHOLZ THROUGH 1994

COMET DESIG.	DISC. DATE T	R.A. Decl.	Instr. Site	hours sessions	elong q	m1 e
1978l	9/12/78	6h41m	25-cm L, 36x	1700.0	72	10.7
C/1978 R3	8/13/78	-18.5	Loma Prieta	691	1.72	1.0004
1985e	5/27/85	0h52m	25-cm L, 32x	1742.3	49	9.3
C/1985 K1	6/28/85	+15.3	Big Bear	694	0.106	1.0
1986e	5/12/86	0h44m	27x120 B	173.5	39	10.3
96P/1986 J2	4/23/86	+38.9	Loma Prieta	86	0.127	0.958
1988j	8/6/88	4h57m	27x120 B	475.5	67	8.6
C/1988 P1	9/17/88	+0.6	Loma Prieta	225	0.165	1.0
1992d	3/31/92	22h09m	12-cm R, 21x	760.3	47	9.4
C/1992 F1	4/22/92	+18.7	Colfax	366	1.26	0.996
1992k	7/2/92	4h44m	27x120 B	61.0	30	9.2
C/1992 N1	7/10/92	+36.9	Colfax	40	0.819	1.0
1994m	7/6/94	3h55m	27x120 B	575.8	55	9.5
C/1994 N1	7/12/94	+70.2	Colfax	337	1.14	1.0
1994o	8/13/94	4h13m	25-cm L, 36x	46.5	72	9.5
P/1994 P1	9/18/94	+62.6	Colfax	21	0.753	0.750
1994r	10/8/94	8h42m	25-cm L, 36x	55.3	80	11.5
C/1994 T1	10/2/94	+55.4	Colfax	34	1.85	1.0

Explanation of columns: for each comet are given two lines; the first column contains the comet's designation (the old-style letter designation first, then the new-style designation); the second column contains the discovery date (month/date/year) and the date of perihelion passage; the third column gives the discovery position (right ascension in hours and minutes of time and declination in degrees for equinox 2000.0); the fourth column gives the discovery instrument (L = reflector, R = refractor, B = binoculars) and site (all in California); the fifth column gives the number of hours and sessions taken to discover each comet (counted from the previous discovery); the sixth column gives the elongation from the sun (in degrees) in the morning sky, and the comet's perihelion distance in astronomical units; the last column gives the discovery magnitude and the comet's orbital eccentricity.

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The End of an Era

David H Levy

[*Ed. note: I asked David if he would write a few remarks for ICQ readers concerning the final observing run at Palomar by this famous comet-hunting team.*]

On Friday night, 1994 December 3 UT, Gene and Carolyn Shoemaker, Henry Holt, and I took the last exposure of our program. It has gone on for many years, so there were lots of feelings and memories that accompanied Carolyn's final closing of the shutters of the 18-inch telescope. For Gene, the program began in 1972, when he started observing with Eleanor Helin. Carolyn joined the effort at the 18-inch in 1982, and discovered her 32nd comet there — 1994k — this year. Henry Holt started to accompany them on some observing runs in 1987, and I joined the team in 1989.

Each month, we would meet at Palomar after a drive from Flagstaff (or for me, from Tucson.) For seven nights we would try to cover as much of the sky as possible in our search for asteroids and comets. On a good run we might take more than 300 films. This last run, which began November 26, was one of our most successful — except for the first hour of the first night and a few hours on the last night, the sky was clear the entire time.

On December 1, we threw a party for the Palomar staff, for it is they who really made the effort possible. Led by Bob Thicksten, the staff has universally been friendly and attentive, helping keep the telescope running smoothly. We presented them with two items, a framed poster of the telescope's most famous discovery, Comet P/1993 F2 (Shoemaker-Levy 9), and a plaque listing all 47 comets discovered to date by the Shoemaker and Helin teams with the 18-inch telescope.

As we closed the observatory door, we wrote these words in the telescope's log: "Second star to the right, and straight on till morning." And these words in the RA and DEC columns: "Tonight we end our asteroid and comet search program at Palomar. May this telescope find happy users and interesting objects for years to come."

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Notice to Contributors of Observations

Because of the new comet-designation system in place as of 1995 January 1, we must inform contributors of computer-tabulated data in the ICQ 80-column format as to what changes are necessary. Since we must completely change the identification portion of each record (columns 1-12), we have also decided to make some other changes that should make the data more useful.

Below is given the old-format key:

```
PERYYYYRNpp YYYY MM DD.DD M/mm.m rrAAA.ATF/xxxx /dd.dd DC /t.tt ANG ICQ XX*OBSxx
```

Here is the new-format key (with a number bar underneath to show column number):

```
IIIYYYYMnL YYYY MM DD.DD eM/mm.m:r AAA.ATF/xxxx /dd.ddnDC /t.ttmANG ICQ XX*OBSxx
123456789 123456789 123456789 123456789 123456789 123456789 123456789 123456789
```

The differences between the old and new are as follows:

• (1) designation: Columns 1-3 ('III') is the new 3-digit code (permanent number) for periodic comets with two or more apparitions (see list on pp. 43-44); this is left blank (as previously) for long-period comets — but for one-apparition short-period comets, place a 'P' in column 3 (columns 1-2 blank). Columns 4-7 ('YYYY') are for the year, column 8 ('M') is for the halfmonth letter designation, column 9 ('n') is for the number within that halfmonth (we will use lower-case letters if more than ten comets are found in a given halfmonth, so that 'a' = 10, 'b' = 11, etc.), and column 10 is for the capital (upper-case) letter denoting components for those comets that split. [NOTE: a list of the last 25 comets to receive old-style designations (with their corresponding new-style designations) is given on page 44 of this issue; for all other pre-1995 comets, consult the new 1995 edition of the *Catalogue of Cometary Orbits* (see page 2 of this issue for further information), which contains a complete list of one-to-one correspondences between the old and new formats.]

• (2) date (Universal Time): this is the same as before, except moved one column to the left (from columns 12-25 to columns 11-24); note that the date may be given to 0.001 day only for photoelectric photometry (which is rarely done), and column 25 would be used for that extra decimal place.

• (3) special note for extinctions: previously, this was put in column 75, but there has often been a need to express more than one note; column 26 has now been created for this purpose, and all contributors should now use column 26 for special notes regarding extinction, etc., using the usual code characters (column 75 is now primarily for internal archival notes, but contributors may use column 75 if there are two notes and column 26 has already been filled).

• (4) Magnitude method, magnitude, reference, instrumentation details, and coma diameter are in the same columns as before; note that columns 34-35 are for the stellar-magnitude source code (which is either one or two letters, but which should always be flush left, starting in column 34).

• (5) A note column has been inserted at column 55 (which previously was always blank), which will be used to denote some particular observed characteristic of the central condensation; this will be discussed fully in the April 1995 *ICQ*. The DC will continue as before, always with a single digit only in column 56; note that the slash (if employed) in column 57 may stand either for "halfway between two integer values" or for "somewhere between two integer values" [thus, '5/' can mean either '5.5' (for those few individuals who are confident that they can evaluate DC to half units) or '5 to 6' for those observers who do not feel that they can make the value to be either 5 or 6, but feel that it should be in that vicinity].

• (6) the rest of the field remains as before, except for a new column at column 64 (also formerly blank), which will be used for those CCD observers who are determining very small tail lengths, on the order of arcsec or a few arcmin: the lower-case letters 'm' or 's' in column 64 will signify that the tail length in columns 60-63 (but *in these special cases only* with a decimal point in column 62 instead of the usual column 61) is given in arcmin or arcsec, respectively. *Note* that the slash in column 59 indicates a space for a tail-length note, which can be either an ampersand (&) for an approximate value, greater-than (>) or less-than (<) signs, or a digit for numbers (in degrees only) greater than 9°.99; now, however, we add in this column 59 the following lower-case letters: l = less than or approximately equal to; g = greater than or

approximately equal to. **Also note that when a question mark (?) is used in column 59**, it means that the observer is uncertain that a tail was present; sometimes a tail length is given *with* the question mark, but this should *never* mean that it is the measurement of the tail's length that is in question (an ampersand should be used for that purpose), but rather that the existence of the tail is in doubt.

Observers may contribute data in the old format or the new format, but only until 1996 Jan. 1. We have programs to convert data in the old format to the new format, but encourage contributors to begin using the new format as soon as possible. If the old format is used, in which the old-style designations are employed for the pre-1995 comets, contributors should employ the above-stated designation format for comets that receive only post-1994 (new-style) designations, with the remainder of the field as previously (i.e., with the date starting in column 12 and only column 75 for extinction notes, etc.). During this new year of 1995, however, we encourage contributors of electronic data to begin using the new format as soon as possible.

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TABULATION OF COMET OBSERVATIONS

We will use the abbreviation "O.S." in the *ICQ* for "old-style designation" — namely, that designation in use prior to 1995 Jan. 1 — for a temporary period of time while readers become familiar with the new system of designations.

Note that for comet P/1994 P1 (Machholz 2; O.S. 1994o), numerous observers reported observations of the comet without mentioning specific companions; in these cases, we have always tagged the observations as belonging to component A — though this may be in error during the brief period when component D was temporarily brighter than A.

Some of the descriptive information in this issue pertains to tabulated data published in the October 1994 issue. Please note that there are certain standard abbreviations used in the descriptive notes section, such as the standard coded abbreviations for instrument type, magnitude method, reference, and observer. Other abbreviations used there include "dia." for diameter; "cond." for condensation; "w/" for with; N, S, E, and W for north(ern), south(ern), east(ern), and west(ern), and NE for northeast(ern), etc.; "p.a." for position angle; "mag" for magnitude; "sec" and "min" for second(s) and minute(s); "alt." for altitude above horizon; and m_1 and m_2 for total and nuclear magnitudes.

NEW DESIGNATION SYSTEM FOR COMETS

As noted on pages 126 and 127 of the October 1994 issue (and see pages 3 and 10 of this issue), the designation system for comets was changed by the International Astronomical Union, effective 1995 January 1. Most routine comet recoveries will no longer get designations; only those short-period comets that are making their first predicted return (after their discovery apparition), and those that have more uncertain predictions (including most or all comets with orbital periods longer than 50 years), will receive year/letter/numeral designations under the new system. That new system uses the designation scheme **YYYY Lnn-X**, where **YYYY** is the year; **L** is the capital letter corresponding to the half-month in which the comet is discovered (or recovered), according to the minor-planet system (A = Jan. 1-15, B = Jan. 16-31, C = Feb. 1-15, D = Feb. 16-28/29, . . ., X = Dec. 1-15, and Y = Dec. 16-31; the letters 'I' and 'Z' are not used); **nn** is the two-digit consecutive number for comets found in that half-month; and **-X** is given if there is more than one nucleus visible for a given comet (given as -A, -B, -C, *etc.*, for the various components).

There has been a stalemate concerning changing of actual comet names (usually reflecting the comets' discoverers), so naming will remain essentially unchanged for the time being, though there is now a committee established under Commission 20 of the IAU to "rubber-stamp" routine names and to resolve disputes.

Note that all comets discovered/recovered prior to 1995 Jan. 1 have been assigned new designations under this new system. On page 44 of this issue is a list of the one-to-one correspondence between the old- and new-designation systems for the last 25 comets to receive letter designations in the old system (plus the former so-called "annual" comets), for readers' convenience. Note that, while all comets found after 1995 Jan. 1 will only have desigations under the new system, the *ICQ* will continue to accept designations for contributed observations under either system, since there will be no ambiguity as to which system is in use. We note, however, that — as under the old system — it is **highly recommended** that all contributors refer to each comet ***both by their designations and their names*** (especially those contributing data via paper rather than in *ICQ* electronic format), to help assure that mistakes in identification have not been made. With so many comets under observation in any given year, and given that even the most careful individuals will sometimes make typographical errors, it is important to have some sort of redundancy; the *ICQ* staff has always intercompared names, provisional-letter designations, and Roman-numeral designations to be sure that there is consistency — and when inconsistencies have arisen, the contributor has often been asked to confirm which comet was intended.

The new "permanent" short-period comet number is especially useful, because it gives meaningful historical context by showing the order in which multi-apparition comets were firmly established as being periodic in orbital nature.

Descriptive Information (to complement the Tabulated Data):

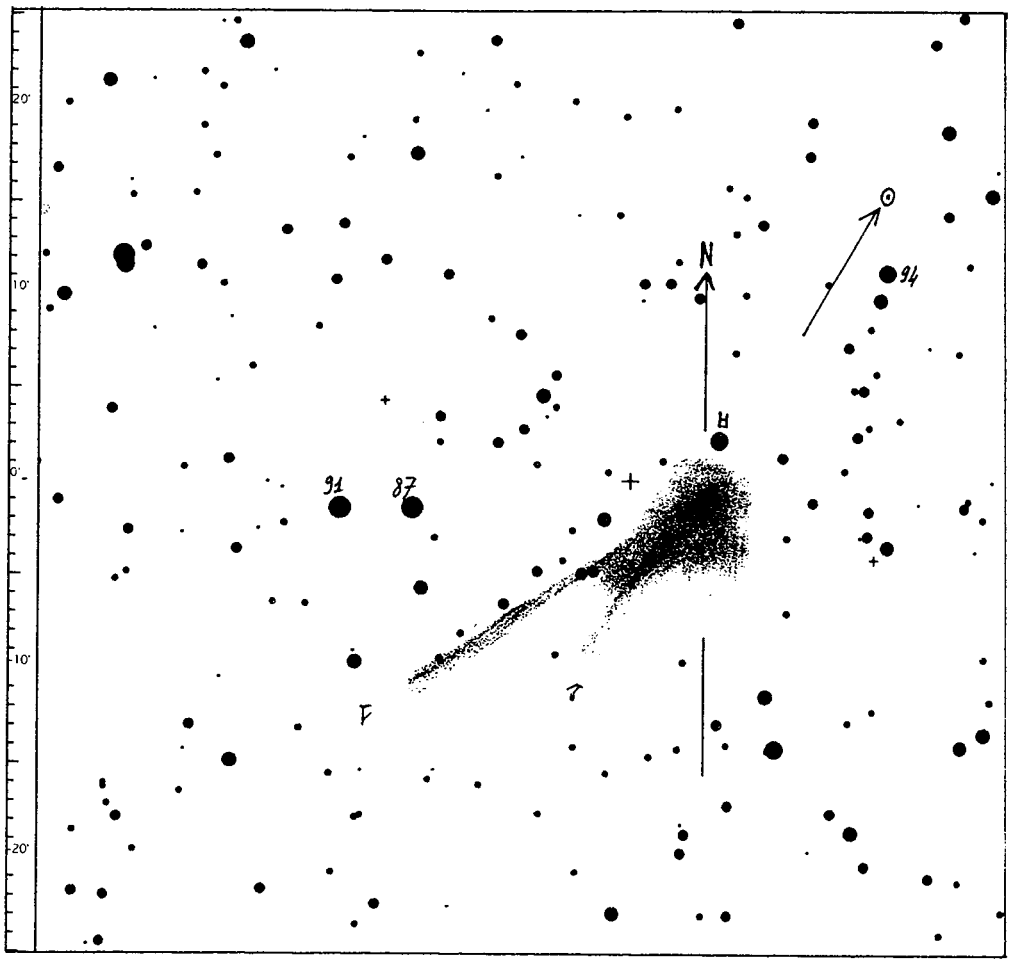
◇ *Comet C/1990 K1 (Levy; O.S. 1990 XX)* ⟹ 1990 July 28.94: m_2 = 7.5, nearly-stellar central cond., faint asymmetric outer halo elongated toward p.a. 250° [MIL02]. Aug. 18.9: m_2 = 10.5 [MIL02]. Aug. 29.90: m_2 = 10.0 (20×80 B) [MIL02].

◇ *Comet C/1993 Q1 (Mueller; O.S. 1993p)* ⟹ 1994 Apr. 30.93: "w/ Swan-band filter, same m_1, but only the inner coma is visible" [DEA]. May 1.93: "comet slightly brighter and more condensed w/ Swan-band filter" [DEA]. May 5.95: "comet fainter w/ Swan-band filter" [DEA].

◇ *Comet C/1993 Y1 (McNaught-Russell; O.S. 1993v)* ⟹ 1994 Mar. 14.82: comet very low [REN]. Mar. 30.84: w/ 20.0-cm *f*/6 T (39×), m_1 = 6.3 (MM: S), DC = 4 [H. Goertz, The Netherlands]. Apr. 5.84: w/ 20.0-cm *f*/6 T (39×), m_1 = 6.5 (MM: S), coma dia. ~ 4′, DC = 4 [H. Goertz]. Apr. 6.86: w/ 20.0-cm *f*/6 T (39×), m_1 = 6.6 (MM: S), coma dia. ~ 5′, DC = 5 [H. Goertz]. May 11.89: outer part of coma very diffuse; weak central cond. [LEH]. June 9.08: w/ 40-cm L *f*/4.5 L (50×), m_1 [12: [REN]. June 12.93: weak central cond. [LEH].

◇ *Comet C/1994 G1 (Takamizawa-Levy; O.S. 1994f)* ⟹ 1994 May 7.02: w/ 12-cm *f*/6 L (40×), comet only 4′ from star of mag 9; 3′.5 coma, DC = 3-4 [REN]. May 9.32 and 19.31: "comet brighter w/ Swan-band filter" [DEA]. May 11.32: "comet slightly brighter w/ Swan-band filter" [DEA]. June 1.94, 4.03, and 12.95: strong central cond. [LEH]. June 5.31: "short, broad, fan tail w/ longer spike tail" [PRY]. June 8.93, 19.90, July 2.89, and 3.96: strong, pointlike central cond. [LEH]. July 1.22 and 4.16: BC UMa sequence [MOD]. July 2.29: comet "involved" w/ bright star of mag 8.4 [SPR]. July 3.17: w/ a 25-cm *f*/3.6 T + CCD camera (+ Wratten No. 15 filter, which gives an effective response near 680 nm and a sharp blue cutoff at 520 nm), well-defined central cond. of dia. 10″ and mag 13.8 [ROQ]. July 7.17: obs. made as on July 3.17 (see above); there was a well-defined central cond. of mag 12.1 and diameter ~ 10″ [ROQ]. July 11.19: comet at alt. ~ 15° [MOD]. July 11.29 and 12.30: comet very difficult to see, in a light-polluted NW region of the sky [SPR]. July 12.15: at 68×, DC = 3 [MOD].

(below) Drawing of Comet C/1994 G1 (Takamizawa-Levy) by Stéphane Garro [GAR02] on June 7.04 UT, using a 20.3-cm f/10 T at 62.5×; the grid at left has hash marks at 1′ intervals.



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◇ *Comet C/1994 J2 (Takamizawa; O.S. 1994i)* ⟹ 1994 June 1.96: strong pointlike central cond. [LEH]. June 8.90: w/ 20-cm *f*/17 R (87×), 2′.5 coma, DC = 3; m_1 is 1/3 from TI star 5548.0374 (V = 9.10) to TI 5548.1255 (B= 11.05), and halfway between TI 5548.0452 (B = 8.95) and TI 5548.0453 (B = 10.80) [LEH]. June 12.88: w/ 20-cm *f*/17 R (87×), 2′ coma, DC = 3; m_1 is 3/4 from TI star 5540.0807 (V = 10.20) to TI 5540.0243 (B = 11.40), is 2/3 from TI 5540.1047 (B = 11.05) to TI 5540.0969 (B = 11.50), and is halfway between TI 5540.0345 (B = 10.80) and TI 5540.1021 (B = 11.50) [LEH]. June 13.02: "comet fainter w/ Swan-band filter" [DEA]. July 4.18: w/ a 25-cm *f*/3.6 T + CCD camera + Wratten No. 15 filter, well-defined central cond. w/ dia. ~ 12″ and mag 13.8; hint of asymmetry in p.a. 102° [ROQ]. July 8.17: obs. made as on July 4.18 (see above); central cond. of dia. ≃ 10″ and mag ≃ 12.7 [ROQ].

◇ *Comet C/1994 N1 (Nakamura-Nishimura-Machholz; O.S. 1994m)* ⟹ 1994 July 11.29: comet more condensed but featureless when a Lumicon "Premium" Deep-Sky filter is used [SPR]. July 12.92 and 13.91: strong, pointlike central cond. [LEH]. July 15.42: w/ a 25-cm *f*/3.6 T + CCD camera + Wratten No. 15 (yellow) filter, poorly-defined central cond. of dia. ~ 10″ and mag 14.6 [ROQ]. Aug. 7.17: w/ 15.0-cm *f*/5 L (25×), 5′.5 coma, DC = 5 [BOR]. Aug. 11.85, Sept. 3.90, 9.85, and 10.85: "weak central cond." [LEH]. Aug. 16.23: under bright moon; comet brighter when #8 filter is used, but no difference when a Lumicon "Premium" Deep-Sky or Lumicon Swan-band filter is used [SPR]. Aug. 16.32: w/ 31.7-cm *f*/6 L (68×), 4′.6 coma, DC = 3 [BOR]. Aug. 22.28: obs. made as on July 15.42 (see above); central cond. of mag 12.32 and dia. ~ 10″ [ROQ]. Aug. 29.11, 30.12, Sept. 6.17, and 7.02: "comet slightly brighter w/ Swan-band filter" [DEA]. Aug. 30.06: "coma extended toward p.a. 150°-225°; diffuse central cond., located at N edge of coma" [DID]. Aug. 30.21: comet much brighter in Lumicon "Premium" Deep-Sky filter [SPR]. Sept. 2.07: "for the first time, using 110×, a tiny but fairly obvious central knot of bright material (not more than 0′.2 in dia.) is noted" [BOR]. Sept. 2.11, 3.07, and 8.02: "comet unchanged w/ Swan-band filter" [DEA]. Sept. 2.18: fan coma extended toward p.a. 245°-25°; "fairly bright but diffuse central cond. w/ a fleeting 12th-mag stellar false nucleus" [DID]. Sept. 3.09: w/ 31.7-cm L (110×), "center of coma sharply condensed, but lacks the tiny bright knot of last night" [BOR]. Sept. 3.10: coma extended toward p.a. 240°-355° [DID]. Sept. 3.90: comet close to star of mag 9 [SCH04]. Sept. 5.15: in 35.9-cm *f*/7 L (164×), stellar cond. of mag 14.3 ± 0.2 [MOD]. Sept. 5.17: obs. made as on July 15.42 (see above); central cond. of mag 12.93 and dia. 11″ [ROQ]. Sept. 6.09: at 170×, "the center of cond. is a minute, essentially stellar nucleus of mag ~ 13, embedded in a tiny cond." [BOR]. Sept. 8.13: w/ 31.7-cm L (68×) and the Lumicon Swan-band comet filter, there is no change in the comet's visibility; at 110×, the coma condenses steadily to the center [BOR]. Sept. 8.19: obs. made as on July 15.42 (see above); central cond. of mag 13.18 and dia. ~ 10″ [ROQ]. Sept. 10.06: w/ 25-cm *f*/6.3 T (62×), m_1 ~ 10-10.5 (MM: B; Ref: VF), 3′ coma, DC = 3 [REN]. Sept. 12.16: "comet brightner w/ Swan-band filter" [DEA]. Sept. 13.15: obs. as on July 15.42 shows central cond. of mag 13.36, weak and poorly defined with a diameter of ~ 4″ [ROQ].

◇ *Comet C/1994 T1 (Machholz; O.S. 1994r)* ⟹ 1994 Nov. 29.20 and Dec. 2.21: w/ 33.3-cm *f*/4 L (201×), coma dia. 1′.1-1′.2; "there seemed to be a fairly dramatic change in only a couple of days, with the nucleus obvious on Nov. 29 (mag 12.5, MM: S, ref: HS), but difficult to see in better conditions on Dec. 2 (m_2 = 13.5, MM: S, ref: HS) [KRO02]. Nov. 30.94: "almost-starlike coma" [MIK]. Dec. 1.21: w/ 30.5-cm *f*/15 R (176×), "comet had a near-stellar, faint, false nucleus of mag perhaps 13" [AUG]. Dec. 1.96: w/ 44.5-cm *f*/5 L (230×), 1′.5 coma, DC = 7-8 [SAR02]. Dec. 3.27: extremely diffuse and faint outer coma with a well-cendensed center (1′.1) and a bright stellar cond. [MOR]. Dec. 3.80: w/ 44.5-cm *f*/5 L (230×), 2′ coma, DC = 6 [KER]. Dec. 18.19: mag of central cond. = 14.5; the diffuse, faint tail curved through p.a. 9° and ended at p.a. 0° [ROQ]. Dec. 21.11: dia. of central cond. < 2″ w/ mag 13.6; during the last 3 days, the tail structure has changed significantly from a curving arc into a low-intensity, fan-like appearance bordered by a diffuse, faint primary tail at the tabulated p.a., and a fainter, diffuse secondary tail at p.a. 19° [ROQ].

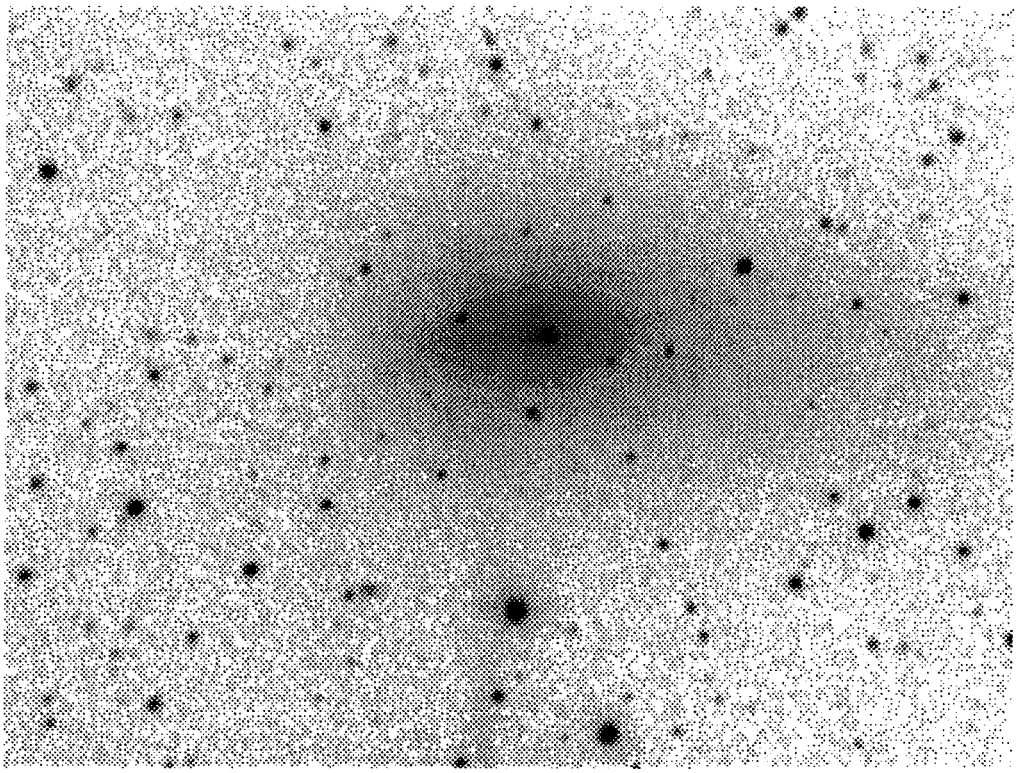
◇ *Comet 19P/Borrelly (O.S. 1994l)* ⟹ 1994 Aug. 30.45: w/ a 25-cm *f*/3.6 T + CCD camera + Wratten No. 15 (yellow) filter, central cond. of dia. 10″ and mag 13.11 [ROQ]. Sept. 4.39: at 164×, fan coma opens to p.a. 148° ± 12° [MOD]. Sept. 8.38: comet involved w/ star of mag 12-13 [MOD]. Sept. 8.46: obs. made as on Aug. 30.45; central cond. of dia. 10″ and mag 12.81 [ROQ]. Sept. 11.39: at 164×, fan coma opens to p.a. 117° ± 10°; stellar cond. of mag ~ 14.0 [MOD]. Sept. 12.36: "moderately condensed, circular coma — more obvious than m_1 suggests"; at 110×, a tiny but clearly stellar nucleus of mag 13.5 (Ref: AC — S Ori chart w/ 129 and 134 stars), surrounded by a very small knot of bright material [BOR]. Sept. 30.42: fan coma opens to p.a. 125° ± 7° [MOD]. Sept. 30.66: "slightly enhanced in Swan-Band filter" [SEA].

Oct. 1.50: "nuclear cond. had dia. ~ 15″ and mag 11.8; m_1 has brightened by 0.3 mag since Sept. 23.43, but the general overall appearance of the central cond. and coma structure has remained essentially unchanged" [ROQ]. Oct. 3.41: fan coma opens to p.a. 120° ± 8° [MOD]. Oct. 6.10: w/ 20.3-cm L (167×), coma dia. 4′; 0°.13 dust tail at p.a. 314°, curved to p.a. 304°, and 0°.11 ion tail at p.a. 335°; at 250×, two jets were seen — one 17″ long at p.a. 286°, slightly curved to p.a. 310°, and a triangular one 40″ long at p.a. 91° [GAR02]. Oct. 7.16: comet close to star of mag 10 [SCH04]. Oct. 7.39: w/ 35.9-cm L (164×), fan coma opens to p.a. ~ 113°; stellar cond. of mag ~ 12.5-13.0 [MOD]. Oct. 8.45: nuclear cond. had dia. 18″ mag 12.2; the anti-tail, as tabulated, had a width of ~ 1′ throughout its observed length [ROQ]. Oct. 10.22: "comet unchanged w/ Swan-band filter" [DEA]. Oct. 11.40: central cond. w/ dia. 17″ and mag 12.0; coma asymmetrical and brighter at p.a. 96° [ROQ]. Oct. 12.16, 18.19, and Nov. 2.16: elongated coma [LOO01]. Oct. 22.47: central cond. had a dia. of 10″ and mag 10.8; the coma appeared somewhat brighter and asymmetrical (extended by 1′) in p.a. 94° [ROQ]. Oct. 28.03, Nov. 1.14, and Dec. 6.03: stellar nucleus, w/ a "distinct discontinuity to the coma" [SHA02]. Oct. 29.34: "comet was near a star; the anti-tail was quite faint; at 67-156×, the DC was greater (DC at least 7) and there was a small (< 1′) knot of material in the coma" [MOR]. Oct. 29.42: central cond. of dia. 22″ and mag 11.6; coma very well defined and somewhat asymmetrical in p.a. 93° [ROQ]. Oct. 30.36: "comet was elongated along p.a. 70°-150°; N side of coma was flat; S side had 5′ semi-circle of material; ends of elongation were narrow and extended 10′ on either side"; anti-tail had a width of 10° [MOR].

Nov. 6.16: w/ 65-cm *f*/4 L (+ CCD), comet's appearance was quite unusual; the axes of the tail and anti-tail define a nearly straight line, along which the comet is elongated; its shape resembles a spindle; fan-shaped 0°.04 anti-tail (p.a. 93°) w/ divergence angle of ~ 25° and prominent bright central "stream" resembling a nearly-straight jet; normal tail visible up to 0°.09 in p.a. 268°; coma dia. 8′, moderate central cond.; measured on a 120-sec clear-filter image [PRA01]. Nov. 6.40: central cond. had mag 10.85 and a dia. of 21″; the coma was well defined and, although no obvious tail structure was evident, a coma asymmetry of 1′.77, as measured from the central cond., was readily apparent at p.a. 92° [ROQ]. Nov. 7.00 and 8.00: 4′ anti-tail in p.a. ~ 90°; observed from Cerro Paranal, Chile [ZAN]. Nov. 8.45: coma elongated to E; w/ 35.9-cm *f*/7 L (85×), 0°.02 tail, ~ 1/3 as wide as coma, toward the W [MOD]. Nov. 10.36: dia. of the central cond.

was 24″ w/ mag 10.7; coma remained well defined and appeared unchanged since Nov. 6.40; coma asymmetry, extending almost 2′ toward the E, continued as a salient feature of the comet [ROQ]. Nov. 11.36: w/ 35.9-cm L, fan coma subtends ~ 40°-50°, to p.a. 94°; tail ~ half as wide as coma [MOD]. Nov. 12.50: "in 26-cm L (45×), comet was fan-shaped (p.a. 80°-170°); N edge of fan was sharp (needle-like) and the S edge was diffuse; edges of fan were brighter than the center" [MOR]. Nov. 26.89: at 117×, 5′ anti-tail in p.a. 105° [VIC]. Nov. 28.05: comet elongated in E-W direction [GRA04]. Nov. 28.25: comet slightly elongated or "fan-shaped" [SPR]. Nov. 29, 30, and Dec. 1: "appeared like an edge-on galaxy" [KRO02]. Nov. 30.31: image w/ Kron-Cousins *V* filter (peak transmission at 550 nm) shows central cond. w/ dia. 15″ and mag 11.8; when imaged through a Kron-Cousins *R* filter (peak transmission at 650 nm), the coma showed a readily-apparent asymmetry along an axis aligned through the nuclear region and extending 3′ in p.a. 91° and 1′.5 in p.a. 275° [ROQ]. Nov. 30.80: faint tail 0°.15 long; anti-tail length 0°.09 [ZNO]. Nov. 30.89: at 117×, 4′ anti-tail in p.a. 105° [VIC]. Nov. 30.99: CCD image obtained w/ 20-cm *f*/2 Baker-Schmidt camera (+ *V* filter + ST-6 CCD) shows elliptical coma ~ 7′ × 10′; delicate fanlike tail ~ 0°.5 long in p.a. 270°; further processing of the image shows a conspicuous sunward tail ~ 3′ long in p.a. 110° [MIK].

(below) CCD image of Comet 19P/Borrelly from Petr Pravec, taken with the 65-cm reflector at the Ondřejov Observatory on 1994 Nov. 6.16 UT; 120-sec exposure with a clear filter. Field of view is 12′.7 × 9′.6 (pixel size 2″.0), with north up and east to the left. Images from Pravec were sent via e-mail in "gif" format, converted to PostScript, and printed on a laser printer.



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Dec. 1.22 and 2.22: fainter of the two tails was 0°.03 long in p.a. 269° [KRO02]. Dec. 1.25: fan-shaped tail [AUG]. Dec. 1.29: in 26-cm L (45×), comet was fan-shaped (p.a. 90°-240°); 15′ at the edges and 10′ in the center; DC = 4 [MOR]. Dec. 2: "coma seemed larger and it was possible that tail material filled the region between the tails on the southward side of the coma" [KRO02]. Dec. 2.06: at 230×, 4′ anti-tail in p.a. 100°-120° and 2′ anti-tail in p.a. 90°-100° [SAR02]. Dec. 3.04: at 75×, 3′ anti-tail in p.a. 80°-110° [SAR02]. Dec. 3.29: in 26-cm L (45×), comet was fan-shaped (p.a. 90° [8′]-240° [10′]); 5′ in the center; there was a stellar cond. (of mag 13.3 at 156×), DC = 4 [MOR]. Dec. 3.35: w/ 35.9-cm *f*/7 L (85×), fan coma of dia. ~ 2′ × 2′.5, subtending ~ 40° to p.a. 92°; DC = 5; tail ~ 0°.03 long, ~ half as wide as coma, in p.a. 267° [MOD]. Dec. 4.01: w/ 20×80 B, diffuse 3′ anti-tail in p.a. ~ 130°; very faint, straight, main tail; observation made at Cima Ekar (elevation 1350 m) w/ excellent sky conditions [MIL02]. Dec 4.125: photo obtained at Cima Ekar by G. A. Milani, M. Tombelli, and S. Bartolini with the 67/90-cm Schmidt telescope of the Asiago Astrophysical Observatory (courtesy of Dr. U. Munari), shows a faint main tail up to 50′ long in p.a. 270°; a short 2′ anti-tail is clearly seen in p.a. 120°; the density of the anti-tail is noticeably stronger than that of the main tail that appears straight and slightly diffuse; a later analysis of this photo shows that the main body of the anti-tail is quite narrow and rectilinear, and seems to point toward p.a. ~ 104°; we suspect that it is not a simple "perspective" anti-tail [MIL02]. Dec. 5.05: w/ 20-cm *f*/14 R (40×), coma dia. 3′, DC = 5 [LAN03]. Dec. 7.02: w/ 20.3-cm L (62.5×), 0°.41 tail

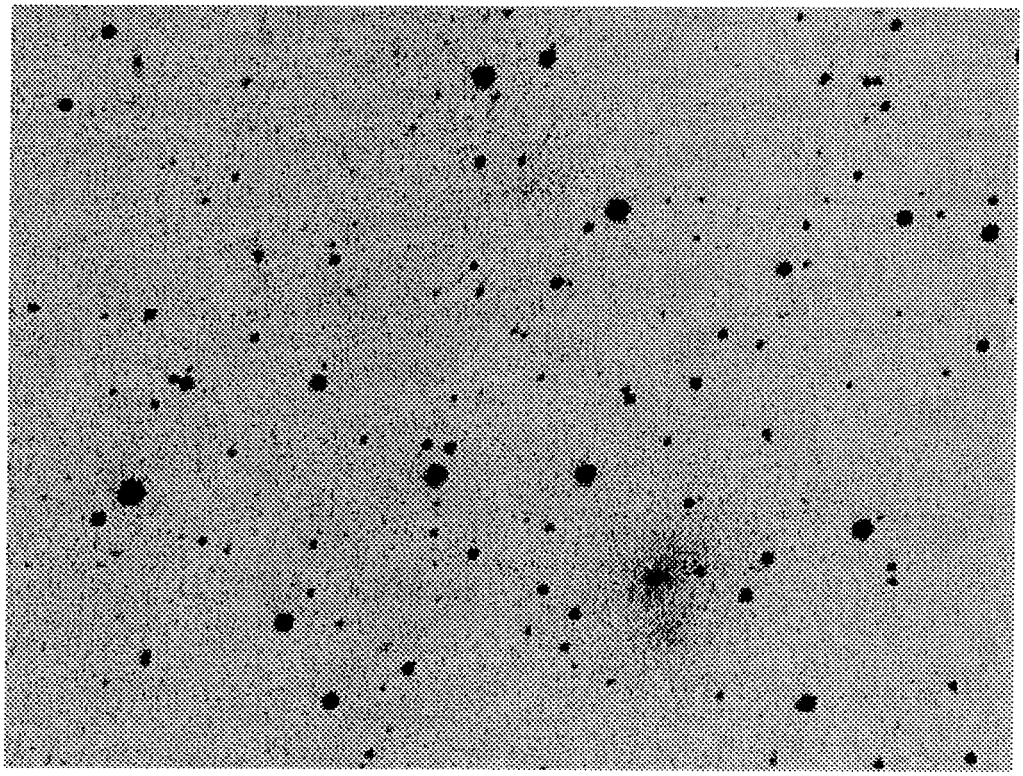
was quite visible from p.a. = 270° to 284°; also a less-prominent 0°.15 anti-tail toward p.a. 114°; inner coma dia. 5′, outer coma dia. 12′ [GAR02]. Dec. 8.29: in 20×80 B, coma elongated (6′ × 9′) toward W; in 26-cm L (45×), coma is a wide fan; the brightest part of the fan is the W edge (15′ in p.a. 280°); the fan swings through the S and ends with a plume of material toward the E (10′ in p.a. 110), which is quite faint [MOR]. Dec. 9.26: comet elongated [SPR]. Dec. 10.35: cirrus interferred with observation [MOR]. Dec. 12.33: 5-min CCD exp. w/ 20-cm *f*/6.3 T (+ ST-6 camera) shows condensed 2′ coma w/ a prominent dust tail extending ~ 20′ at p.a. 95°; also very apparent is a jet or spike pointing approximately sunward and flattening the coma into an elliptical shape [Tim Puckett, Astronomical Society of the Atlantic (ASA); taken from *The Electronic Journal of the ASA 6*(5), Dec. 1994; contact the *EJASA* at e-mail address *ist@america.net*]. Dec. 15.20: CCD image (obtained as on Nov. 30.99) shows elliptical coma ~ 7′ × 11′ and a delicate fan-like tail ~ 0°.6 in p.a. 270°; "further image processing (removal of outer coma) clearly shows straight sunward tail ~ 4′ long in p.a. 115°; the position and shape of the anti-tail is almost the same as on the similar *V* image taken on Nov. 30, which might indicate that it is not a 'perspective' dust tail but probably a kind of ion tail; additional narrow-band observations seem in favor of this suspicion; a 10-min exp. obtained on Dec. 15.21 w/ the same camera configuration and H_2O^+ filter (central wavelength 620 nm, FWHM = 10 nm) clearly shows the same structure, while another 5-min exp. w/ the red continuum filter (central wavelength 647 nm, FWHM = 10 nm) shows only diffuse fan-like structure extending between p.a. 0° and 115°" [MIK].

◇ *Comet 16P/Brooks 2 (O.S. 1994j)* ⟹ 1994 July 12.36: "comet's position ~ 1′.5 from star of mag ~ 9" [MOD].

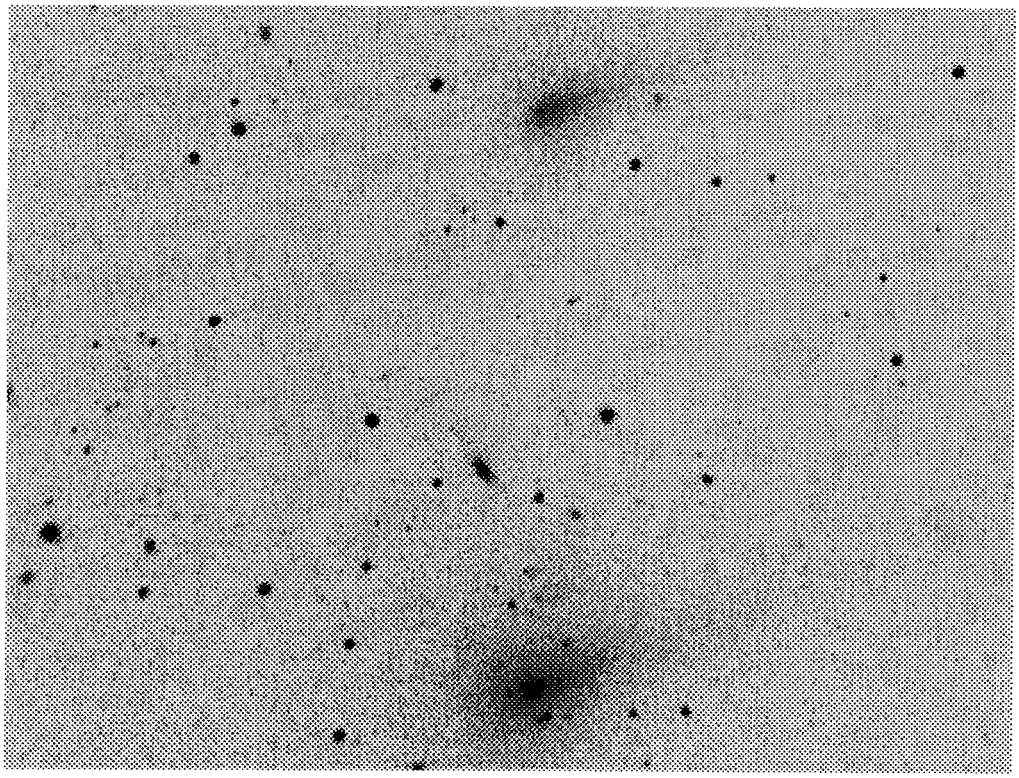
◇ *Comet 51P/Harrington (O.S. 1994g)* ⟹ 1994 June 13.43: component C shows a faint tail [SCO01]. Sept. 11.37: "involved w/ star of mag ~ 14" [MOD]. Oct. 4.40: tail curves from p.a. 278° at a point 2′.2 from the nucleus of component A to p.a. 272° at a point 10′.4 out from the nucleus; component B was diffuse [SCO01]. Oct. 5.40: tail curves from p.a. 283 at 2′.0 to 274° at 7′.2 [SCO01]. Oct. 7.33, 11.33, and 12.31: coma elongated toward p.a. 270° [MOD]. Oct. 7.33: at 164×, stellar cond. of mag ~ 14.5 [MOD]. Oct. 9.56: "small, strong, condensed coma — not enhanced using Swan-band filter" [SEA].

◇ *Comet P/1994 P1 (Machholz 2; O.S. 1994o)* ⟹ 1994 Aug. 16.23 and 17.23: difficult, diffuse object in bright moonlight; best seen without the aid of Lumicon "Premium" Deep-Sky or Swan-Band filters [SPR]. Aug. 28.36: comet much brighter than expected (outburst in progress); coma obviously condensed and easily seen, despite moonlight [BOR]. Aug. 30.05: w/ 65-cm *f*/3.6 L (+ CCD), different appearance in *V* and *R* filters; in *R*, coma dia. 6′.5 and asymmetric inner coma of somewhat irregular appearance, w/ tail length 0°.13; in *V*, coma dia. 9′.0 and inner coma more radially symmetrical than in *R*, but some anisotropy is still present; tail less prominent than in *R*; the "total" *V* magnitudes were measured in apertures w/ dia. 2′.0 and 1′.3; the morphology was measured on 90-sec composite images both in *V* and R; observations obtained by Michal Varady and reduced by Petr Pravec [PRA01]. Aug. 30.10: comp. D (Jäger's discovery) has coma dia. 2′.2 w/ faint halo 3′.5, inner coma extended in p.a. 308°; moderate central cond.; morphology measured on composite image of 320 sec total integration time in clear filter, magnitudes measured on 60-sec *V* filter image; in *R* (and consequently similarly in clear filter), the CCD images show moderate and well-measurable central cond., but the *V* images are much more diffuse and only very little central cond. is present therein [PRA01]. Aug. 30.36: w/ 31.7-cm *f*/6 L (68×), coma condenses rather suddenly near center; component A has DC = 5, coma dia. 4′.4; comp. D has m_1 ~ 11, DC = 1, coma dia. 2′.5-3′; Lumicon Swan-band comet filter apparently enhances comet but also darkens moonlit sky significantly; at 110×, no separate central cond. or nucleus; secondary companion noted w/ great difficulty — visible *only* w/ use of Swan-band filter (in transit of a faint star), as just a very faint mist surrounding the star [BOR]. Aug. 30.39: fleeting stellar nucleus (m_2 ~ 12) w/in central cond. of dia. 30″ [DID]. Aug. 31.98: DC = "7-9!"; bright, starlike nucleus (m_2 ~ 8) [CHE03].

Sept. 1.90: dense central cond. of dia. ~ 2′ [CHE03]. Sept. 2.30: extended coma spans p.a. 220°-315°; at 46×, "very bright 1′ central cond. w/ an 11th-mag false nucleus at the edge of a fan coma"; at 130×, no noticeable false nucleus [DID]. Sept. 2.36: w/ 10×50 B, bright, strongly condensed, and strikingly obvious; w/ 32-cm (68×), coma is teardrop-shaped w/ a noticeable but very faint, narrow tail; Lumicon Swan-band filter does not seem to have any effect on comet's visibility; no secondary companions noted [BOR]. Sept. 2.38: w/ 37-cm *f*/6 L (+ telecompressor), 60-sec CCD images of the primary component show a rather pronounced "almost flat front" to the coma; overall, the coma is roughly tear-shaped (or heart-shaped) — with the "point of the tear" in p.a. 300° (nearly opposite the comet's direction of travel); a rather prominent ion tail runs from the nucleus, thru the "point of the tear", w/ its total length being at least 6′ (in p.a. 300°); several faint streamers curved out from the nucleus (especially from the N side of the nucleus), eventually becoming almost parallel to the ion tail; estimated width of coma is at least 3′.7 [G. R. Viscome, Lake Placid, NY, U.S.A.]. Sept. 2.90: no stellar central cond. [CHE03]. Sept. 3.31: extended coma spans p.a. 285°-315°; fleeting stellar cond. of mag 12 or 13 [DID]. Sept. 5.08: main components are increasing its brightness rapidly; this is the first time I obtained an over-exposed nucleus on 60-sec clear-filter images; comp. A had coma dia. > 10′; the comet significantly brightened since Sept. 4.06 (although absolute calibration wasn't obtained and magnitudes were determined using the GSC, they should be nearly correct *V* magnitudes, as I checked using usual extinction parameters for our station); 3 prominent jets in inner coma; complex tail — main "ray" in p.a. 300°, another one in p.a. 308°; brightening present in the main "ray" of the tail — moved from the central cond. from distance of 305″ on Sept. 5.0797 to 460″ on Sept. 5.1043 UT; comp. D is located 307″ from A in p.a. 24° and has coma dia. 3′.5 w/ little central cond. [observer Radek Vystavěl; measurer P. Pravec; PRA01]. Sept. 5.35-5.38: obs. made as on Sept. 2.38 (above); comet appears to be developing quite rapidly; all ten images obtained tonight show what seems to be a rather pronounced jet emanating in p.a. 190° from the nucleus; it has the shape of an equilateral triangle w/ one point of the triangle on the nucleus; the jet then fans out, with the base of the triangle forming an E-W line; from the nucleus to the middle of the base of the triangle (p.a. 190°), the distance is ~ 40″; there also seemed to be another small jet emanating from the nucleus at p.a. ~ 45°, whose total



Above: CCD image of Comet P/1994 P1 (Machholz 2), showing components C, D, and E (discovery frame of component E), from Petr Pravec, taken with the 65-cm reflector at the Ondřejov Observatory on 1994 Sept. 4.108 UT; 60-sec exposure with a clear filter. Component C is faint smudge near top center; component D is large smudge to right of bottom center, and faint component E is just below D. Field of view is $12\farcm7 \times 9\farcm6$ (pixel size $2\farcs0$), with north up and east to the left. **Below:** CCD image of Comet P/1994 P1 taken (details as above) on Oct. 11.145, showing components A (the brightest component), B (faint and diffuse), C (visible as a condensation in the coma of D), and D (the second brightest component). What is evidently an elongated galaxy appears just below center. Integration time 120 sec in a clear filter.



[cont. from page 15] length was ~ 30″, and it seemed to curve back toward the tail slightly; another feature of note is the development of a prominent, slightly-forked (rather bright) tail of length ~ 65″ within the coma (not seen in images I took on Sept. 4); this tail extends from the nucleus toward p.a. 300°; the total size of the coma that I see (in a 1-min CCD integration) is now ~ 6′; visually, a faint and quite-diffuse straight tail seems to extend at least half a degree; w/ 10×50 B, m_1 = 6.25 [G. Viscome]. Sept. 6.37: "comet appears less bright than yesterday morning; w/ 32-cm L (110×), no separate central cond. or nucleus apparent; straight tail at least 0°.3 long, occasionally suspected to 0°.5 [BOR]. Sept. 7.35, 8.35, and 12.31: broad fan tail [DID]. Sept. 8.08: measured on 60-sec clear-filter image; conditions not fully photometric (clouds); comp. A's brightness decreased by ~ 2 mag since Sept. 5.08; asymmetries (jets?) present in inner coma of A; jet activity in nuclear region is now less prominent in A than during Sept. 2.1-5.1; comp. D is located 273″ in p.a. 25° from comp. A, and has coma dia. 1′.2 but little central cond. [PRA01]. Sept. 8.37: w/ binoculars, comet is significantly fainter than before — no longer impressive and somewhat smaller; w/ 31.7-cm *f*/6 L (68×), DC = 6, 0°.3 tail in p.a. 310°; tail almost as wide as coma's dia. [BOR]. Sept. 8.41 and 10.40: tail half as wide as coma [MOD]. Sept. 9.45: w/ 32-cm L (116×), component A has m_1 = 7.4 (ref: T Lyn AC), coma dia. 6′; comp. D, m_1 = 11.0, coma 3′; comp. "(C?)", m_1 = 12.2, 2′ coma; comp. B, m_1 = 12.0, DC = 2; approximate distances A-D = 30′, A-B = 5′, D-C = 6′ (this places "C" much farther from "D" than the 43″ given on *IAUC* 6070, so possibly this object is not C, but a different component); the coma of comp. A is elongated to the NNE, with comp. B being located at the tip (but within) the elongated coma of A; at Sept. 9.46, m_1 = 7.4 for comp. A w/ 7×50 B (in twilight) [KEE]. Sept. 11.40: w/ 35.9-cm L, slight elong. of coma suspected to p.a. ~ 207° [MOD]. Sept. 11.40 and 12.41: tail 1/3 to 1/2 as wide as coma [MOD].

Oct. 3.36: component D of size 3′, DC = 0-1, m_v = 10 [DID]. Oct. 4.38: component D is 3′ across, DC = 0, m_v = 10.1 [DID]. Oct. 5.11: both A and D components are very diffuse; no nuclear cond. visible; comet is in the brightest part of the zodiacal light [KYS]. Oct. 5.14: "CCD observations were re-calibrated using the Landolt standards, so they should be accurate to ~ 0.2 mag now; the error is due to uncertainty in extinction, and there were errors in the GSC magnitudes for stars in the given area (the true magnitudes are ~ 1.1 mag brighter; sometimes there are really large errors of magnitudes in the Guide Star Catalogue)"; when compared with its appearance on Sept. 23.11, comp. A is now fainter by ~ 1 mag (see pages 154-5 of October 1994 *ICQ*); the activity associated w/ D is significantly lower than on Sept. 23.13 (this is apparent also from the rather low DC) [PRA01]. Oct. 6.18: in the dawn, w/ 20.3-cm *f*/10 T (167×), component B (8′.5 in p.a. 7° from comp. A) is 0′.9 across, DC = 1, $m_1 \simeq$ 11.4 (MM: S, Ref: AC) [GAR02]. Oct. 7.36: component D is 3′ across, DC = 0, m_v = 10.5 [DID]. Nov. 2.18: m_1 for comp. A and D measured in aperture w/ dia. 1′.0, while the actual comae are somewhat larger; comp. A has coma dia. 1′.8 w/ faint halo of dia. 3′ (not very strong central cond.); comp. B has no central cond.; comp. D has coma dia. 1′.6; double character of the nucleus of comp. D is indicated by an elongation of the central cond. w/ slightly more "lights" at ends than in the middle [~ 15% more intensity for comp. D_1 (E end) and 7% for D_2]; estimated separation between D_1 and D_2 is 9″ in p.a. 100°-280°; observations obtained in seeing of 4″, w/ comet's altitude ~ 30° [PRA01].

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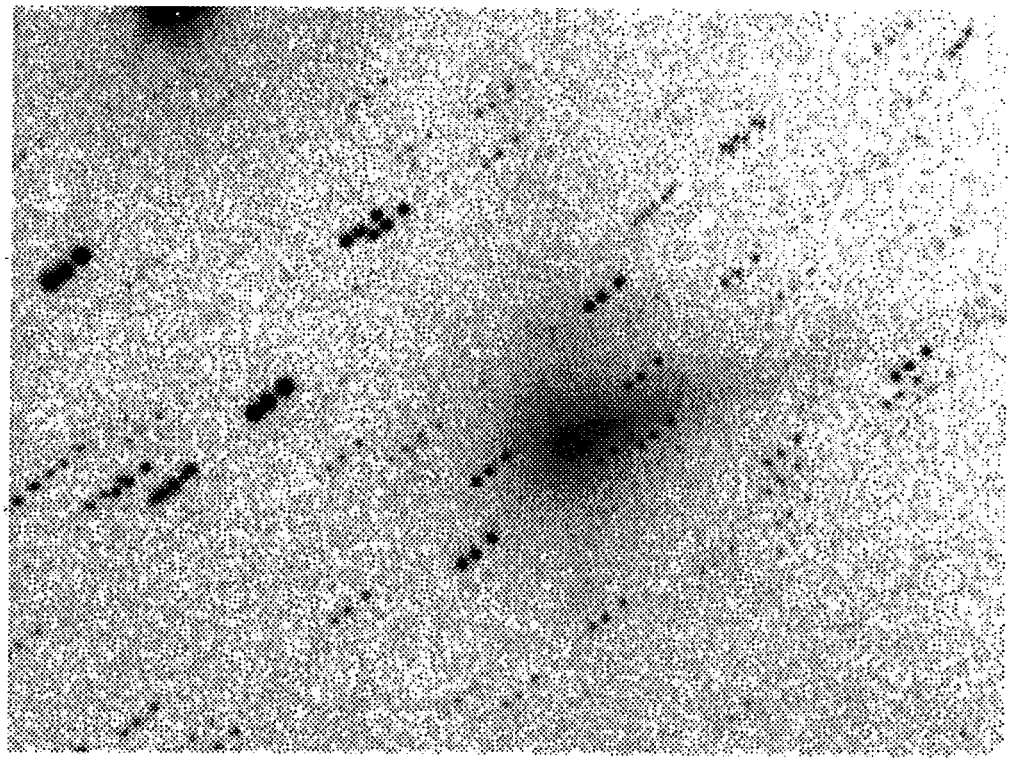

Above: composite CCD image (180 sec total integration time) of Comet P/1994 P1 (Machholz 2), taken by Pravec on Oct. 5.14 as described on page 16, showing component D and the trail along its orbit (see descriptive information on page 154 of the October 1994 *ICQ*). The comet's tail points west-northwestward (to the right), while the trail passes through component D from north-northeast to south-southwest (top to bottom of image).

◇ *Comet P/1994 X1 (McNaught-Russell; O.S. 1994u)* ⟹ 1994 Dec. 15.01: coma dia. 0′.4 w/ strong central cond. and tailward extension 0′.3 long in p.a. 340°; comet observed at alt. 15° in very good sky conditions; measured on image w/ 300-sec integration time [PRA01].

◇ *Comet 44P/Reinmuth 2 (O.S. 1993g)* ⟹ 1994 July 12.35: "two stars of mag ~ 13 at comet's position" [MOD]. Aug. 16.34: stellar cond. of mag ~ 15, somewhat offset from the coma's center [MOD]. Sept. 8.34: comet w/in 1′ of star of mag 10-11 [MOD]. Sept. 10.35: comet ~ 1′ from star of mag ~ 14 [MOD]. Oct. 12.27: coma elongated to W [MOD].

◇ *Comet 29P/Schwassmann-Wachmann 1* ⟹ 1994 Oct. 14.76: w/ 25-cm *f*/6 reflector + CCD, m_1 = 15.6; comet diffuse, with fan-shaped coma extending to the N-NW [T. Kojima, Chiyoda, Japan]. Oct. 22.79: CCD observation as on Oct. 14.76 (see above) reveals m_1 = 14.6, the comet evidently undergoing a small outburst; the appearance is almost stellar, with a faint, fan-shaped coma [T. Kojima]. Nov. 6.17: inner coma has jets from the nucleus toward the NE; strong central cond. [PRA01]. Dec. 5.78 and 9.70: a region of size 10″ × 10″ was measured as 'm_2' [NAK01].

◇ *Comet 9P/Tempel 1 (O.S. 1993c)* ⟹ 1994 Apr. 17.43: faint starlike nucleus [PRY]. May 4.97 and 6.02: "comet slightly brighter w/ Lumicon Swan-band filter" [DEA]. May 7.97, 8.99, 10.95, June 7.03, and 12.01: "comet unchanged w/ Swan-band filter" [DEA]. May 11.86, June 8.91, and 12.91: strong central cond. [LEH]. May 30.02: "comet brighter w/ Swan-band filter" [DEA]. June 1.85: weak central cond. [LEH]. June 9.19: in 35.9-cm *f*/7 L (164×), stellar cond. of mag 14.3 ± 0.1; fan coma opens to S [MOD]. June 12.91: w/ 20-cm *f*/17 R (87×), 3′.5 coma, DC = 3-4 [LEH]. July 1.17: comet alt. ~ 18°; comparison stars at same alt. as comet [MOD]. 1994 July 6.18: w/ a 25-cm *f*/3.6 T + CCD camera + Wratten No. 15 filter, well-defined central cond. of dia. ~ 9″ and mag 13.6 [ROQ]. July 10.17: obs. made as on July 6.18 (see above); poorly-defined central cond. w/ dia. ~ 7″ and mag 13.2 [ROQ]. July 11.16: comet alt. ~ 10°; comparison stars at same alt. as comet [MOD]. July 12.13: comet alt. ~ 21°; comparison stars at same alt. as comet [MOD].

◇ *Comet 10P/Tempel 2* ⟹ 1994 Nov. 24.54: fan-shaped coma spans p.a. 75°-290° [NAK01].

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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, C = unfiltered CCD integration, c = same as 'C', but for nuclear magnitudes, V = electronic observations — usually CCD — with Johnson *V* filter, *etc.* — see October 1980 issue of *ICQ*, pages 69-73]. "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 (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 (available free of charge via e-mail). *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 (and p. 10 of this 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 [07 = Comet Section, British Astronomical Assn.; 11 = Dutch Comet Section; 16 = Japanese observers (c/o Akimasa Nakamura, Kima, Japan); 18 = Polish observers (c/o Arkadiusz Olech, Pruszcz, Poland); 23 = Czech group (c/o P. Pravec); 32 = Hungarian group (c/o K. Sarneczky); etc.]. Those with asterisks (*) preceding the 5-character code are new additions to the Observer Key:*

APF	23	Ladislav Apfelthaler, Czech Republic
AUG		Todd Augustyniak, IL, U.S.A.
BAR06		Alexandr R. Baransky, Ukraine
BOR		John E. Bortle, NY, U.S.A.
BRO04	27	Eric Broens, Belgium
CAN03	27	Giuseppe Canonaco, Belgium
CHE03		Kazimieras T. Cernis, Lithuania
COM	11	Georg Comello, The Netherlands
CSU	32	Matyas Csukas, Romania
*DAM	36	Matteo Damiani, Italy
DEA		Vicente Ferreira de Assis Neto, Brazil
DID		Richard Robert Didick, MA, U.S.A.
DIE02	27	Alfons Diepvens, Belgium
*DIM	36	Alessandro Dimai, Italy
FOG	36	Sergio Foglia, Italy
GAR02		Stephane Garro, France
GRA04	24	Bjoern Haakon Granslo, Norway
GRZ	18	Piotr Grzywacz, Lodz, Poland
HAS02		Werner Hasubick, Germany
HAS07	16	Akie Hashimoto, Japan
HOR02	23	Kamil Hornoch, Czechoslovakia
HUD02	23	T. Hudecek, Czech Republic
ISH02	16	Akiyoshi Ishikawa, Japan
ITO02	16	Kazuyuki Ito, Japan
IWA01	16	Yoshitaka Iwaki, Japan
KAN04	16	Shigemi Kanbara, Japan
KEI		Graham Keitch, England
KER	32	Akos Kereszturi, Hungary
KOB01	16	Juro Kobayashi, Japan
KON03	16	Eitoshi Konno, Japan
KOS	07	Attila Kosa-Kiss, Romania
KRO02		Gary W. Kronk, IL, U.S.A.
KRY01		Timur Valerevich Kryachko, Russia
KYS	23	J. Kysely, Czech Republic
LAN03	07	James A. Lancashire, England
LEH		Martin Lehky, Czechoslovakia
LOO01		Frans R. van Loo, Belgium
MIK		Herman Mikuz, Slovenia
MIL02	36	Giannantonio Milani, Italy
*MIN01	16	Kenichirou Minami, Japan
MIT	16	Shigeo Mitsuma, Japan
MOD		Robert J. Modic, OH, U.S.A.
MOE		Michael Moeller, Germany
MOR		Charles S. Morris, U.S.A.
NAG02	16	Takashi Nagata, Hyogo, Japan
NAK01	16	Akimasa Nakamura, Japan
NOW		Gary T. Nowak, VT, U.S.A.
PLE01	18	Janusz Pleszka, Poland
POP	23	Martin Popek, Czech Republic
PRA01	23	Petr Pravec, Czech Republic
PRY		Jim Pryal, WA, U.S.A.
REN		Alexandre Renou, France
ROQ		Paul Roques, AZ, U.S.A.
SAR02	32	Krisztian Sarneczky, Hungary
SCH04	11	Alex H. Scholten, The Netherlands
SCI	18	Tomasz Sciezor, Poland
SCO01	08	James V. Scotti, AZ, U.S.A.
SEA	14	David A. J. Seargent, Australia
SEA01	14	John Seach, Australia
SHA02	07	Jonathan D. Shanklin, England
SIW	18	Ryszard Siwiec, Poland
SPR		Christopher E. Spratt, BC, Canada
SZE02	32	Laszlo Szentasko, Hungary
TOM01		Maura Tombelli, Italy
TSU02	16	Mitsunori Tsumura, Japan
VIC	32	Zoltan Vician, Hungary
VIE		Jean-Francois Viens, Quebec, Canada
YAS	16	Masanori Yasuki, Japan
ZAN		Mauro Vittorio Zanotta, Italy
*ZIE	18	Piotr Zielinski, Krakow, Poland
ZNO	23	Vladimir Znojil, Czech Republic

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Comet C/1975 V1 (West) [= 1976 VI, old-style designation]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1976 03 04.2	a S	0.6:	AA	0.0	E		1			3		MIL02
1976 03 12.19	S	3.0:	AT	3.0	B	4	6	3	7	2		MIL02
1976 03 18.17	S	3.8	AA	3.0	B	4	6	4	7	1		MIL02
1976 03 19.18	S	3.7	AA	3.0	B	4	6	4				MIL02
1976 03 25.15	S	4.5	AA	3.0	B	4	6	4				MIL02
1976 03 29.16	S	5.2	AA	3.0	B	4	6	4				MIL02
1976 04 01.15	S	5.6	AA	3.0	B	4	6	4				MIL02
1976 04 04.15	S	5.7	AA	3.0	B	4	6	4				MIL02
1976 04 11.16	S	6.2:	AA	3.0	B	4	6	4				MIL02

Comet C/1989 Q1 (Okazaki-Levy-Rudenko) [= 1989 XIX]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1989 09 20.80	B	9.0	A	25	T	10	125	2.5	3			DIM
1989 10 01.80	B	8.5	A	25	T	10	125	2.5	5			DIM
1989 10 03.80	B	8.4	A	15	R	15	55	2.5	5			DIM
1989 10 09.80	B	8.0	A	25	T	10	125	2.5	4/			DIM
1989 10 16.80	B	7.5	A	25	T	10	125	3	5			DIM
1989 10 19.80	B	7.0	A	25	T	10	125	3	5	0.83	45	DIM
1989 10 24.80	B	6.5	A	5.0	B		8	3	5	0.33	45	DIM
1989 11 01.20	B	6.5	A	5.0	B		8	3.5	5			DIM
1989 11 08.20	B	6.0	A	5.0	B		8	7	6	3	342	DIM
1989 11 18.20	B	6.2	A	10	R	15	55		6	0.66		DIM
1989 11 24.25	B	6.1	A	5.0	B		8					DIM
1989 11 25.20	B	6.0	A	5.0	B		8		6	1		DIM
1989 11 27.25	B	6.1	A	5.0	B		8		6			DIM

Comet C/1989 W1 (Aarseth-Brewington) [= 1989 XXII]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1989 11 24.75	B	8.5	A	25	T	10	125	3	5	0.16	48	DIM
1989 11 25.20	B	8.5	A	50	L	5	137	3	5	0.16	45	DIM

Comet C/1989 X1 (Austin) [= 1990 V]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1990 03 31.79	B	4.3	SC	8.0	B		20					DIM
1990 04 10.80	B	3.5	SC	8.0	B		20			1		DIM
1990 04 27.16	B	4.6	SC	5.0	B		10			1.7		DIM
1990 04 30.16	B	5.3	SC	5.0	B		10			1.7		DIM
1990 05 01.16	B	5.3	SC	5.0	B		12			1.7		DIM
1990 05 04.15	B	5.3	SC	5.0	B		10					DIM
1990 05 17.99	B	5.5	SC	5.0	B		10					DIM
1990 05 27.94	B	7.5	A	5.0	B		12	8	5			DIM

Comet C/1990 K1 (Levy) [= 1990 XX]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1990 06 29.02	B	9.0	A	5.0	B		10					DIM
1990 07 17.85	B	7.4	A	5.0	B		10					DIM
1990 07 18.99	B	7.5	A	15	R	15	55	5	6	0.11	230	DIM
1990 07 28.94	S	5.8	AA	8.0	B	5	20	12	7	0.5	250	MIL02
1990 07 30.94	B	6.5	A	5.0	B		10			1		DIM
1990 08 09.83	B	5.4	SC	5.0	B		10					DIM
1990 08 10.85	B	5.0	SC	5.0	B		10	8.5	6			DIM
1990 08 12.83	B	4.4	SC	5.0	B		10	9	6	1	195	DIM
1990 08 15.87	S	3.8	AA	3.0	B	4	6	30	6			MIL02
1990 08 15.92	B	4.5	SC	5.0	B		10	10	6	0.8	190	DIM
1990 08 16.85	B	4.5	SC	5.0	B		10		6			DIM
1990 08 16.87	S	3.2	AA	0.0	E		1					MIL02
1990 08 17.85	B	4.3	SC	5.0	B		10		6			DIM
1990 08 17.87	S	3.0:	AA	0.0	E		1					MIL02
1990 08 18.90	S	3.0:	AA	0.0	E		1					MIL02
1990 08 18.90	S	3.6	AA	3.0	B	4	6	25	7			MIL02
1990 08 18.90	S	4.2:	AA	8.0	B	5	20					MIL02
1990 08 18.91	B	4.2	SC	8.0	B		20	10	6	1	170	DIM
1990 08 19.86	B	4.3	SC	5.0	B		10	12.5	6			DIM
1990 08 19.90	S	3.8	AA	3.0	B	4	6					MIL02
1990 08 21.90	B	4.1	SC	5.0	B		10	13	6	0.3		DIM
1990 08 22.86	B	4.1	SC	5.0	B		10	14	6	1		DIM
1990 08 22.98	S	3.5	AA	0.0	E		1					MIL02
1990 08 22.98	S	3.7	AA	3.0	B	4	6			2		MIL02
1990 08 23.86	B	4.0	SC	5.0	B		10	11	6	1		DIM
1991 02 16.92	B	8.0	A	5.0	B		10	4				DIM
1991 02 18.92	B	8.5	A	5.0	B		10					DIM
1991 04 15.81	S	10.8:	GA	11	L	7	32	4	2			BAR06

Comet C/1991 A2 (Arai) [= 1990 XXVI]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1991 01 15.86	S	9.0:	AA	29.8	L	5	60	3.0				KEI
1991 01 17.91	S	8.9	AA	10.0	B		20	5.0				KEI

Comet C/1991 Y1 (Zanotta-Brewington) [= 1992 III]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1991 12 28.74	S	9.3	AA	8.0	B	5	20	6				MIL02
1992 01 02.83	S	8.8	AA	10.0	B		20	3.3	6			KEI
1992 01 03.80	S	8.9	AA	10.0	B		20	3.9	5/			KEI
1992 01 05.73	S	9.0	AA	8.0	B	5	20	5				MIL02
1992 01 10.76	S	7.8	AA	10.0	B		20	2.0	6			KEI
1992 01 11.76	S	7.8	AA	10.0	B		20	3.3	6			KEI

Comet C/1991 Y1 (Zanotta-Brewington) [= 1992 III] (cont.)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1992 01 21.73	I	7.5:	NP	10.0	B		25					KYS
1992 01 22.73	I	7.3:	NP	10.0	B		25					KYS
1992 01 23.73	I	7.3:	NP	10.0	B		25					KYS
1992 01 26.79	S	7.5:	AA	10.0	B		20	4.6	7			KEI
1992 01 28.73	I	6.8:	NP	10.0	B		25					KYS

Comet C/1991 X2 (Mueller) [= 1992 VIII]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1992 02 24.75	I	7.5:	NP	5.0	B		7	5	3			KYS
1992 03 01.76	I	8.0:	NP	5.0	B		7	4	6			KYS
1992 03 04.76	O[	8.0:	NP	10.0	B		25	& 3				KYS
1992 04 08.11	O[	10.0:	NP	11	L	8	54	& 3				KYS

Comet C/1992 F1 (Tanaka-Machholz) [= 1992 X]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1992 05 09.90	S	7.0	AA	10.0	B		20	1.7				KEI
1992 05 09.90	S	7.1	AA	5.0	B		10					KEI
1992 05 11.10	S	7.0	AA	3.2	B		6	4.5				KEI
1992 05 11.10	S	7.1	AA	5.0	B		10	4.5	5/			KEI
1992 05 11.10	S	7.1	AA	10.0	B		20	3.8	6/	0.13	297	KEI
1992 05 15.91	S	7.5	AA	10.0	B		20	2.3				KEI
1992 05 17.91	S	8.1	AA	10.0	B		20	2.4	4			KEI
1992 05 24.97	S	8.4	AA	10.0	B		20	3.6	4/	0.08	317	KEI
1992 05 25.93	S	8.4	AA	10.0	B		20	4.2	5			KEI

Comet C/1991 T2 (Shoemaker-Levy) [= 1992 XIX]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1992 06 21.02	S	8.1	AA	5.0	B		10	5.4	6			KEI
1992 06 27.99	S	7.9	AA	5.0	B		10	3.4				KEI
1992 07 10.93	S	8.1	AA	10.0	B		20	2.3	7	0.5	49	KEI
1992 07 19.94	S	7.3	AA	5.0	B		10	2.2	8			KEI
1992 07 19.94	S	7.5	AA	10.0	B		20	2.2	8	0.33	50	KEI
1992 07 24.93	S	8.0	AA	5.0	B		10	3.0	7			KEI
1992 07 28.86	B	8.5	NP	11	L	8	32	2	6			KYS

Comet C/1993 F1 (Mueller) [= 1992 XX]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 07 07.23	C	19.6	FA	91.4	L	5		0.18		&0.03	328	SC001
1994 07 07.23	c	22.2	FA	91.4	L	5						SC001

Comet C/1993 A1 (Mueller) [= 1993a]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 09 28.17	S	10.2	AA	25.2	L	4	53	1.4	6			LO001
1993 10 12.79	S	10.1	AA	25.2	L	4	53	1.5	3			LO001
1993 10 17.88	S	10.1	AA	25.2	L	4	53	2	6			LO001
1993 11 05.76	S	8.6	AA	12.0	B		20	3	6	0.15	360	LO001
1993 11 17.88	S	9.1	AA	12.0	B		20	3	5			LO001
1993 11 18.79	S	9.4	AA	25.2	L	4	53	2	6			LO001
1994 01 19.72	M	9.5	NP	30	L	5	60	3.5				POP

Comet C/1993 Q1 (Mueller) [= 1993p]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 11 05.77	S	12.2	AA	25.2	L	4	53	1	6			LO001
1994 04 30.93	S	8.7	AA	7.0	B		10	7.2	3			DEA
1994 05 01.93	S	9.2	AA	7.0	B		10	5.4	2			DEA
1994 05 03.97	S	9.5	AA	7.0	B		10	5.4	2			DEA
1994 05 05.95	S	8.6	S	7.0	B		10	9.3	2			DEA

Comet C/1993 Q1 (Mueller) [= 1993p] (cont.)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 05 07.38	S[	9.5	AA	8.0	B		15					SEA01
1994 05 11.39	S[	9.7	AA	8.0	B		15					SEA01

Comet C/1993 Y1 (McNaught-Russell) [= 1993v]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 03 09.81	& B	9.8:	AA	12	L	6	40	3	4/			REN
1994 03 13.72	S	7.6	S	10	B		25	&15	3			PLE01
1994 03 14.82	B	8.8:	AA	12	L	6	40		4/			REN
1994 03 17.73	B	7.3	S	6.0	B		20	&18	3/			PLE01
1994 03 21.75	B	7.3	S	6.0	B		20	&12	3/	&0.2	355	PLE01
1994 03 22.75	S	7.1:	S	6.0	B		20	& 6	4			SCI
1994 03 26.75	B	8.2	S	6.0	B		20	& 6	4	&0.33	353	SCI
1994 03 26.76	B	7.0	S	10	B		25	20	4	0.75	358	PLE01
1994 03 27.81	S	6.4	AA	20.3	T	10	81	&20	1/			SIW
1994 03 28.82	S	6.4	AA	20.3	T	10	81	&20	1/			SIW
1994 03 28.83	B	6.3	AA	6.0	B		20	&20	1/			SIW
1994 03 29.82	S	6.3	AA	20.3	T	10	81	&20	2			SIW
1994 03 29.83	B	8.1	AA	12	L	6	40	5	5			REN
1994 03 30.75	B	7.1	S	10	B		25	&15	3/	&0.5	0	PLE01
1994 03 31.10	S	6.5	SC	8.0	B		11	2.5	6			PRY
1994 03 31.76	B	7.7	S	6.0	B		20	&12	3/			SCI
1994 03 31.83	S	6.1	AA	20.3	T	10	81	&22	2	&1.0		SIW
1994 03 31.84	B	6.1	AA	6.0	B		20	&22	2	&1.5		SIW
1994 04 02.85	S	6.1	AA	20.3	T	10	81	&20	2			SIW
1994 04 03.76	B	7.0	S	6.0	B		20	&20	3			PLE01
1994 04 03.76	B	8.0	S	6.0	B		20	&12	3			SCI
1994 04 05.86	S	6.2	AA	20.3	T	10	81	&20	2			SIW
1994 04 07.85	B	6.3	AA	6.0	B		20	&20	2			SIW
1994 04 07.86	B	8.1	AA	12	L	6	40	5.5	5/			REN
1994 04 07.86	S	6.4	AA	20.3	T	10	81	&20	2			SIW
1994 04 07.94	M	7.6	NP	30	L	5	40	16				POP
1994 04 10.91	M	7.1	NP	30	L	5	40					POP
1994 04 10.93	B	7.9	AA	12	L	6	40	6	5			REN
1994 04 11.86	B	8.2	AA	25	L	6	43					REN
1994 04 11.86	B	8.3	AA	25	L	6	60					REN
1994 04 11.89	B	7.7	AA	8.0	B		12	7	5			REN
1994 04 11.94	B	7.9	AA	12	L	6	40		5			REN
1994 04 12.80	B	7.4	S	6.0	B		20	18	3	0.3	36	PLE01
1994 04 14.91	M	6.5	NP	30	L	5	40	25				POP
1994 04 14.94	B	8.1	AA	8.0	B		12	7	4			REN
1994 04 14.95	B	8.3	AA	12	L	6	40	7	4			REN
1994 04 15.79	B	7.8	S	6.0	B		20	&10	3	&0.22	40	SCI
1994 04 18.81	B	7.6	S	10	B		25	&22	3			PLE01
1994 04 18.85	S	7.9	S	6.0	B		20	& 6	3			SCI
1994 04 19.80	B	7.6	S	6.0	B		20	&16	3			PLE01
1994 04 19.81	S	7.9	S	6.0	B		20	& 8	2/			SCI
1994 04 20.81	S	7.6	S	6.0	B		20	& 8	2/			SCI
1994 04 20.82	B	7.9	S	6.0	B		20	&16	3			PLE01
1994 04 21.82	B	8.0	S	10	B		25	&12	3			PLE01
1994 04 22.81	S	8.3:	S	6.0	B		20	& 6	2/			SCI
1994 04 23.83	B	8.2	S	10	B		25	17	3			PLE01
1994 04 23.83	S	8.3:	S	6.0	B		20	& 6	2			SCI
1994 04 25.85	S	8.4	S	10	B		25	&10	3			PLE01
1994 04 26.83	S	8.8:	S	6.0	B		20	& 5	3			SCI
1994 04 27.88	B	8.4	AA	8.0	B		12	7	4			REN
1994 04 28.83	B	8.8	S	10	B		25	&10	3			PLE01
1994 04 28.85	B	8.8:	S	6.0	B		25	& 6	3			SCI
1994 04 29.83	S	9.3:	S	6.0	B		20	& 6	3			SCI
1994 04 29.85	M	8.9	S	10.0	B	4	25	4.5	3			LEH
1994 05 01.92	B	8.9	AA	8.0	B		12	8	4			REN
1994 05 02.84	S	9.5	S	35	M	10	90	8	3			PLE01
1994 05 02.87	B	9.2:	S	10	M	10	40	6				ZIE

Comet C/1993 Y1 (McNaught-Russell) [= 1993v] (cont.)

DATE (UT)		MM	MAG.	RF	AP.	T	F/	PWR		COMA	DC	TAIL	PA	OBS.
1994 05 04.86		B	9.5:	S	10	M	10	40						ZIE
1994 05 04.86		S	9.9	S	35	M	10	90		6	2/			PLE01
1994 05 06.93		M	9.2	TI	10.0	B	4	25		8	2/			LEH
1994 05 07.00		B	9.3	AA	8.0	B		12		7	4			REN
1994 05 07.98		S	10.2	S	9	R	6	45						GRZ
1994 05 08.07		S	9.4	AC	25.4	L	6	71		5	2			VIE
1994 05 08.90		B	9.3	AA	8.0	B		12			3			REN
1994 05 11.89		M	10.4	TI	10.0	B	4	25		7	2			LEH
1994 05 12.91		B	9.4	AA	8.0	B		12		6	3			REN
1994 05 18.06		B	10 :	AA	8.0	B		12			1			REN
1994 05 18.07		B	10.6	VF	12	L	6	40		8	2			REN
1994 05 20.25		S	9.8	AC	11.4	L	8	40		7	2			VIE
1994 06 01.92		M	11.1	TI	20	R	17	87		2.5	2/			LEH
1994 06 08.03		[11	:		12	L	6	40	!	1				REN
1994 06 08.95		M	12.3	HS	20	R	17	140		2.5	2/			LEH
1994 06 12.93		M	12.2	HS	20	R	17	87		2	2			LEH

Comet C/1994 G1 (Takamizawa-Levy) [= 1994f]

DATE (UT)		MM	MAG.	RF	AP.	T	F/	PWR		COMA	DC	TAIL	PA	OBS.
1994 05 02.01		B	10.0	VF	12	L	6	40		3.5	4			REN
1994 05 03.02		B	10.0	VF	12	L	6	40		4	4			REN
1994 05 09.12		B	9.4	VF	8.0	B		12			4			REN
1994 05 09.12		B	9.5	VF	12	L	6	40		4	4			REN
1994 05 09.32		B	8.5	S	7.0	B		10		5.4	5			DEA
1994 05 11.01		B	9.1	VF	8.0	B		12		4	4			REN
1994 05 11.32		S	8.5	S	7.0	B		10		8.0	3			DEA
1994 05 15.20		S	8.8	AC	11.4	L	8	40		2.5	3			VIE
1994 05 15.89		M	9.0	NP	30	L	5	60		1.5				POP
1994 05 18.16		S	8.8	AC	11.4	L	8	40		3.0	3			VIE
1994 05 19.31		B	8.5	S	7.0	B		10		7.6	4			DEA
1994 05 20.30		S	8.8	AC	11.4	L	8	40		6	3			VIE
1994 05 20.31		S	8.5	S	7.0	B		10		7.6	3			DEA
1994 05 22.30		S	8.7	AC	11.4	L	8	40		5	3			VIE
1994 06 01.00		B	8.5	VF	8.0	B		12		5	4			REN
1994 06 01.94		M	8.5	S	10.0	B	4	25		9	3/			LEH
1994 06 04.03		M	8.6	S	10.0	B	4	25		8	3/			LEH
1994 06 04.04		M	9.0	S	20	R	17	87		3	4			LEH
1994 06 04.23		S	8.9	AC	11.4	L	8	40		3	3			VIE
1994 06 05.31		S	8.5	S	20	T	10	100		2.7	6	0.02	170	PRY
1994 06 06.15		S	9.4	AC	11.4	L	8	40		2.7	3			VIE
1994 06 08.02		B	9.0	VF	8.0	B		12		6	5			REN
1994 06 08.93		M	8.5	S	10.0	B	4	25		9	4/			LEH
1994 06 08.94		M	9.0	S	20	R	17	87		3	5/			LEH
1994 06 09.08					40	L	4	50		3.67	5/	0.20	102	REN
1994 06 10.13		S	9.8	AC	11.4	L	8	40		3	3			VIE
1994 06 11.95		B	9.1	VF	8.0	B		12		6				REN
1994 06 12.95		M	8.8	S	10.0	B	4	25		6	4			LEH
1994 06 18.26		M	10.2	GA	20.0	L	5	35		2.6	2			MOD
1994 06 19.30		M	10.5	GA	20.0	L	5	35		2.3	2			MOD
1994 06 19.30		S	10.2	GA	20.0	L	5	35						MOD
1994 06 19.90		M	8.7	S	10.0	B	4	25		6	5			LEH
1994 07 01.22		M	10.7	AC	35.9	L	7	85		1.4	3			MOD
1994 07 01.98		S	10.5:	NP	20.0	L	4	42	&	4	3			SCH04
1994 07 02.89		M	10.6	TI	20	R	17	87		3.5	5			LEH
1994 07 03.96		M	10.8	TI	20	R	17	87		4	5			LEH
1994 07 04.16		M	11.1	AC	35.9	L	7	85		1.5	3			MOD
1994 07 04.16		M	11.4	GA	35.9	L	7	85						MOD
1994 07 11.19	a	S	11.3	GA	20.0	L	5	35		2.2	1			MOD
1994 07 12.15		S	11.2	GA	20.0	L	5	35		1.8	1			MOD
1994 07 14.19		S	11.0	AC	11.4	L	8	40		5	3			VIE
1994 08 08.10		S[	12.2	GA	35.9	L	7	164	!	0.5				MOD
1994 11 08.85		C	13.8	GA	60.0	Y	6			1.4			325	NAK01
1994 12 05.84		C	14.0	GA	60.0	Y	6			1.6			350	NAK01

Comet C/1994 J2 (Takamizawa) [= 1994i]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 05 18.13	S	10.3	AC	25.4	L	6	71	1.5	4			VIE
1994 05 20.29	S	9.8	AC	11.4	L	8	40	3	4			VIE
1994 06 01.93	M	10.0	NP	30	L	5	60	1.5				POP
1994 06 01.96	M	10.3	TI	20	R	17	87	3	4			LEH
1994 06 04.00	M	10.3	TI	20	R	17	87	2.5	3			LEH
1994 06 13.02	S	10.2	AC	31	L		61	4.5	6			DEA

Comet C/1994 N1 (Nakamura-Nishimura-Machholz) [= 1994m]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 07 08.9	S	10.0	A	25.2	L	4	53	3	3			L0001
1994 07 08.99	B	10.6	VF	40	L	4	50	3.5	4/			REN
1994 07 10.24	S	10.4	GA	20.0	L	5	35	2.8	1/			MOD
1994 07 10.93	S	9.9	A	25.2	L	4	53	3	3			L0001
1994 07 10.98	B	10.3	VF	12	L	6	40	3.5	4/			REN
1994 07 11.22	S	9.6	NP	31.7	L	6	68	3.6	4			BOR
1994 07 11.33	M	10.3	GA	20.0	L	5	35	2.8	3			MOD
1994 07 11.33	S	10.2	GA	20.0	L	5	35					MOD
1994 07 11.97	S	10.3	AA	25.2	L	4	53	3	3			L0001
1994 07 12.92	M	9.7	TI	10.0	B	4	25	5	4			LEH
1994 07 12.98	S	9.5	A	25.2	L	4	53		2			L0001
1994 07 12.99	S	9.3	NP	20.0	L	4	42	7	6			SCH04
1994 07 13.29	S	10.0	GA	20	L	8	46	3	1			DID
1994 07 13.32	S	10.1	GA	20.0	L	5	35	2.6	2			MOD
1994 07 13.91	M	9.7	TI	10.0	B	4	25	5	4			LEH
1994 07 14.27	S	10.0	GA	20	L	8	130	3	1			DID
1994 07 14.96	M	9.6	NP	30	L	5	60	2				POP
1994 07 17.96	S	9.4	AC	20.0	T	10	78	3.5	3			COM
1994 07 28.90	B	9.3	AA	15.6	L	10	54	5	2			KOS
1994 07 29.85	B	9.3	AA	15.6	L	10	54	5	2			KOS
1994 07 29.91	S	9.1	AC	20.0	T	10	78	& 2	2/			COM
1994 07 30.10	S	9.6	GA	20	L	8	130	4	0/			DID
1994 07 31.88	B	9.1	AA	15.6	L	10	54	5	2			KOS
1994 08 01.89	S	9.3	A	25.2	L	4	53		3			L0001
1994 08 02.93	S	9.3	NP	20.0	L	4	42	4	5			SCH04
1994 08 03.95	S	8.8	AC	28.0	T	10	108	& 3	2/			COM
1994 08 03.96	S	9.2	NP	20.0	L	4	42	7	4			SCH04
1994 08 04.88	S	8.9	GA	12.0	R	5	25	4	4			CHE03
1994 08 05.86	S	8.8	GA	12.0	R	5	22	4.0	4			CHE03
1994 08 05.92	S	9.1	NP	20.0	L	4	40	8	3			SCH04
1994 08 06.00	B	8.7	AA	15.6	L	10	54	8	2			KOS
1994 08 06.12	B	8.5	AA	15	L	5	25	8	5			NOW
1994 08 06.91	S	8.7	AC	8.0	B		15	& 3	2/			COM
1994 08 07.13	S	9.5	GA	20	L	8	46	4	1			DID
1994 08 07.17	S	8.5	NO	5.0	B		10	5.5				BOR
1994 08 07.25	S	9.6	NO	20.0	L	5	35	3.0	2			MOD
1994 08 08.14	S	8.7	NO	31.7	L	6	68	5.5	4			BOR
1994 08 08.14	S	8.7	NP	31.7	L	6	68					BOR
1994 08 08.16	S	9.4	NO	20.0	L	5	35	3.4	2			MOD
1994 08 08.91	S	8.7	AC	28.0	T	10	88	& 3	2/			COM
1994 08 09.13	S	9.5	GA	20	L	8	46	4	1			DID
1994 08 09.14	S	8.8	NO	31.7	L	6	68	4.0	3/			BOR
1994 08 09.84	S	8.4	AA	5.0	R	5	12		5			CHE03
1994 08 09.86	B	8.4	AA	15.6	L	10	54	10	2			KOS
1994 08 09.91	S	8.7	AC	28.0	T	10	88	& 3	3			COM
1994 08 10.78	B	8.6	AA	11.0	B	4	20	5.5	5			CHE03
1994 08 11.08	B	8.5	AA	10.0	B	4	20	8	2			NOW
1994 08 11.77	B	8.5	AA	11.0	B	4	20	6.0	5			CHE03
1994 08 11.85	M	7.7	TI	10.0	B	4	25	5	2/			LEH
1994 08 11.94	S	9.1	A	25.2	L	4	53	5	3			L0001
1994 08 12.03	B	8.0	AA	5.0	B		7	8	2			REN
1994 08 12.81	B	8.7	AA	11.0	B	4	20	6.5	5			CHE03
1994 08 12.86	B	8.1	AA	15.6	L	10	54	14	2			KOS

Comet C/1994 N1 (Nakamura-Nishimura-Machholz) [= 1994m] (cont.)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 08 13.78	B	8.7	AA	11.0	B	4	20	6.5	5			CHE03
1994 08 13.85	B	8.5	AA	8.0	B	4	10		5			CHE03
1994 08 14.00	B	8.0	AA	15.6	L	10	54	14	2			KOS
1994 08 14.84	B	8.6	AA	11.0	B	4	20	8.2	5			CHE03
1994 08 14.90	B	7.8	AA	15.6	L	10	54	15	2			KOS
1994 08 14.92	S	8.6	AC	20.0	L	4	42	9	3			SCH04
1994 08 15.88	B	8.6	AA	11.0	B	4	20	8.2	5			CHE03
1994 08 15.98	S	8.4	AC	20.0	T	10	63	& 3	3			COM
1994 08 16.31	S	9.8	NO	20.0	L	5	35	2.7	2			MOD
1994 08 16.32	S	8.5	AC	5.0	B		10	8	2			BOR
1994 08 16.86	B	8.8	AA	11.0	B	4	20		5			CHE03
1994 08 17.02	S	8.6	AC	28.0	T	10	108	& 3	2			COM
1994 08 17.91	B	8.8	AA	11.0	B	4	20	8.5	5			CHE03
1994 08 18.05	S	8.7	AC	20.0	T	10	77	3	2			COM
1994 08 18.93	B	8.7	AA	11.0	B	4	20	8.5	5			CHE03
1994 08 19.95	B	8.7	AA	11.0	B	4	20	8	5			CHE03
1994 08 20.95	S	8.5:	AA	11.0	B	4	20	8	5			CHE03
1994 08 24.67	S	8.6	AA	11.0	B	4	20	8	5			CHE03
1994 08 25.71	S	8.8	AA	11.0	B	4	20		5			CHE03
1994 08 26.73	S	8.5	AA	11.0	B	4	20	9	5			CHE03
1994 08 26.92	M	8.8	S	10.0	B	4	25	6.5	3			LEH
1994 08 27.75	B	8.4	AA	11.0	B	4	20		5			CHE03
1994 08 27.89	M	7.8	NP	30	L	5	60	3				POP
1994 08 28.09	S	9.2	GA	20	L	8	46	5	1			DID
1994 08 28.78	B	8.3	AA	11.0	B	4	20	10	5			CHE03
1994 08 28.85	B	8.3	AA	15.6	L	10	54	15	2			KOS
1994 08 28.87	S	8.8	AC	20.0	L	4	42	7	5			SCH04
1994 08 28.88	S	8.8	AC	8.0	B		15	10	6			SCH04
1994 08 29.11	S	8.0	S	7.0	B		10	12.9	2			DEA
1994 08 29.84	B	8.2	S	8.0	B	4	10	12	5			CHE03
1994 08 29.87	S	9.0	AC	28.0	T	10	88	& 3	1/			COM
1994 08 30.06	S	9.3	GA	20	L	8	46	7	1	?0.11	150	DID
1994 08 30.12	S	8.2	S	7.0	B		10	12.0	1			DEA
1994 08 30.21	M	9.8	GA	20.0	L	5	35	2.5	3			MOD
1994 08 30.8	S	8.3	NO	8.0	B		20	7.5	2			BOR
1994 08 30.8	S	8.6	NO	31.7	L	6	68	4.3	3/			BOR
1994 08 30.86	M	8.8	S	10.0	B	4	25	7	3			LEH
1994 08 30.89	B	8.3	AA	15.6	L	10	54	15	2			KOS
1994 08 30.93	B	7.8	S	8.0	B	4	10	12	4			CHE03
1994 08 31.90	B	8.1	S	8.0	B	4	10	13	4			CHE03
1994 09 01.89	B	8.2	S	8.0	B	4	10	14	5			CHE03
1994 09 02.07	S	8.7	AC	31.7	L	6	68	3.1	4			BOR
1994 09 02.11	S	8.6	S	7.0	B		10	16.0	4			DEA
1994 09 02.18	S	9.2	GA	20	L	8	46	5	4			DID
1994 09 02.84	B	8.5	S	8.0	B	4	10	16	5			CHE03
1994 09 02.86	B	8.5	AA	5.0	B		7	8	5			REN
1994 09 03.07	S	8.3	S	7.0	B		10	17.6	3			DEA
1994 09 03.09	S	8.5	AC	8.0	B		20	8	3			BOR
1994 09 03.09	S	8.8	AC	31.7	L	6	68	3.6	4			BOR
1994 09 03.10	S	9.4	GA	20	L	8	46	5	3			DID
1994 09 03.90	M	8.7	S	10.0	B	4	25	7	2/			LEH
1994 09 03.90	S	9.6	AC	20.0	L	4	42	& 4	6			SCH04
1994 09 03.95	S	8.4	S	11.0	B	4	20	7.5	5			CHE03
1994 09 04.88	M	8.8	S	10.0	B	4	25	10	3			LEH
1994 09 04.91	B	8.5	AA	5.0	B		7	8	4			REN
1994 09 04.91	M	9.9	S	10	B		25					HUD02
1994 09 05.15	S	10.0	GA	20.0	L	5	35	3.5	1			MOD
1994 09 05.80	M	8.9	S	10.0	B	4	25	8	3			LEH
1994 09 05.89	S	10.1	AC	20.0	L	4	42	5	1/			SCH04
1994 09 06.05	S	8.9	AC	20.0	T	10	78	& 4	1			COM
1994 09 06.09	S	9.2	AC	31.7	L	6	68	5.0	4			BOR
1994 09 06.17	S	8.9	S	7.0	B		10	12.0	3			DEA
1994 09 06.80	B	8.3	AA	15.6	L	10	54	14	1			KOS

Comet C/1994 N1 (Nakamura-Nishimura-Machholz) [= 1994m] (cont.)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 09 07.02	S	8.7	S	7.0	B		10	18.0	3			DEA
1994 09 08.02	S	8.7	S	7.0	B		10	13.6	3			DEA
1994 09 08.13	S	9.0	AC	8.0	B		20	6				BOR
1994 09 08.13	S	9.5	AC	31.7	L	6	68	2.9	3			BOR
1994 09 08.15	S	10.3	GA	20.0	L	5	35	3.2	1/			MOD
1994 09 08.98	S	8.8	AA	10.0	B		20	3.7	2/			KEI
1994 09 09.85	M	9.1	S	10.0	B	4	25	5	2/			LEH
1994 09 09.92	S	9.1	AA	10.0	B		20	5.5	1/			KEI
1994 09 10.14	S	8.4	S	8.0	B		20	17	1			KRO02
1994 09 10.14	S	8.9	S	33.3	L	4	56	5.2	2			KRO02
1994 09 10.22	S	10.7	GA	20.0	L	5	35	2.6	1			MOD
1994 09 10.83	B	8.4	AA	15.6	L	10	54	14	1			KOS
1994 09 10.85	M	9.3	S	10.0	B	4	25	5	2			LEH
1994 09 10.86	S	9.2	AA	10.0	B		20	5.6	1			KEI
1994 09 11.10	S	9.3	AC	8.0	B		20	4	1			BOR
1994 09 11.10	S	9.7	AC	31.7	L	6	68	3.7	3			BOR
1994 09 11.19	S	10.8	GA	20.0	L	5	35	2.5	1			MOD
1994 09 12.12	S	10.1	AC	31.7	L	6	68	3.1	2/			BOR
1994 09 12.16	S	8.9	S	7.0	B		10	14.0	2			DEA
1994 09 12.18	S	10.9	GA	20.0	L	5	35	2.6	1			MOD

Comet C/1994 T1 (Machholz) [= 1994r]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 10 13.11	S	11.2	AC	28.0	T	10	78	& 4	1			COM
1994 10 15.15	S	11.5	HS	20.3	T	10	51	1.4	3			HAS02
1994 10 15.40	M	12.3	GA	35.9	L	7	85					MOD
1994 10 15.40	S	12.2	GA	35.9	L	7	85	1.7	3			MOD
1994 10 16.13	S	10.8	NP	40.6	L	4	53	4.5	3			ZAN
1994 10 18.08	O[	11.5	TI	35	L	5	92	& 1				HOR02
1994 10 18.79	M	11.3	NP	30	L	5	40					POP
1994 10 25.84	M	12.3	TI	35	L	5	92	1.5	2			HOR02
1994 10 28.02	S	11.7	HS	20	R	14	155	0.9	3			SHA02
1994 10 28.22	M	12.4	GA	35.9	L	7	85	1.3	3			MOD
1994 10 28.94	S	11.0	AC	35	L	6	194	2	2			BRO04
1994 10 29.32	S	10.6	NP	25.6	L	4	67	3.8	2			MOR
1994 10 29.78	S	12.2	HS	41.0	L	5	73	2.2	2			KOB01
1994 10 30.05	S	10.8	AC	30.5	L	5	117	0.8	6			VIC
1994 10 30.34	S	10.5	NP	25.6	L	4	45	4.8	2			MOR
1994 10 30.71	C	12.0	GA	60.0	Y	6		3.5				NAK01
1994 10 31.73	S	11.5	HS	41.0	L	6	80	3.4	3			KOB01
1994 10 31.89	M	12.5	TI	35	L	5	92	1.9	3/			HOR02
1994 11 01.16	S	11.3	HS	33.3	L	5	85	1.1	2			SHA02
1994 11 01.86	M	11.6	TI	35	L	5	92	2.5	3/			HOR02
1994 11 01.98	S	11.3	HS	20	R	14	155	1.1	3			SHA02
1994 11 03.40	M	12.1	GA	35.9	L	7	85	1.5	3			MOD
1994 11 04.13	S	10.7	AC	15.0	R	15	85	3.0	3			DIE02
1994 11 04.71	C	12.5	HS	20.0	L	6		1.8				IT002
1994 11 07.03	B	10.6	AA	15.6	L	10	54	2	2			KOS
1994 11 07.12	S	11.4	TI	11	L	8	54	1.2	3			KYS
1994 11 07.84	C	11.9	GA	60.0	Y	6		3.0				NAK01
1994 11 08.44	S	11.5	GA	20.0	L	5	35	2.2	1/			MOD
1994 11 08.93	S	11.0	AC	35	L	5	103	2	3			BRO04
1994 11 10.67	S	11.3	HS	25	L	4	42	& 1.5				KON03
1994 11 11.33	M	11.6	GA	35.9	L	7	85	1.4	4			MOD
1994 11 11.38	M	11.6	GA	20.0	L	5	35	1.4	3			MOD
1994 11 12.47	M	10.7	NP	25.6	L	4	45	2.5	4			MOR
1994 11 16.85	O[	11.0	TI	35	L	5	92	& 2				HOR02
1994 11 22.74	B	9.8	AA	15.6	L	10	54	3	2			KOS
1994 11 22.80	M	11.6	HS	35	L	5	92	2.2	3/			HOR02
1994 11 23.74	B	10.0	AA	15.6	L	10	54	3	2			KOS
1994 11 25.74	M	10.9	TI	10	B		25	3.5	4			ZNO
1994 11 25.89	B	10.7	AA	15.6	L	10	54	3	2			KOS

Comet C/1994 T1 (Machholz) [= 1994r] (cont.)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 11 26.11	M	11.8	GA	35.9	L	7	85	0.9	4			MOD
1994 11 26.79	B	10.8	AA	15.6	L	10	54	2	2			KOS
1994 11 26.89	S	10.4	AC	30.5	L	5	117	2.0	6			VIC
1994 11 28.15	S	10.8	AA	20	T	10	102	2.0	3/			SPR
1994 11 29.20	S	10.5	HS	33.3	L	4	56	3.1	6			KR002
1994 11 29.32	M	9.8	NP	25.6	L	4	45		6	0.1	15	MOR
1994 11 29.91	S	11.3:	AC	15.2	L	5	42	2.0	1			MOE
1994 11 29.94	S	8.8	AC	15.0	R	15	85	3.0	7			DIE02
1994 11 30.14	S	10.5	HS	33.3	L	4	56	3.3	6			KR002
1994 11 30.69	C	11.1	GA	60.0	Y	6		4.2			5	NAK01
1994 11 30.78	M	11.4	TI	10	B		25	2.5	4			ZNO
1994 11 30.89	B	10.6	AA	15.6	L	10	54	2	2			KOS
1994 11 30.89	S	10.2	AC	30.5	L	5	117	2.0	6/	0.03	350	VIC
1994 11 30.94	S	8.8	AC	15.0	R	15	85	3.0	8			DIE02
1994 11 30.94 !	V	11.7	YF	20.0	T	2		& 2	8			MIK
1994 12 01.21	S	10.3	HS	33.3	L	4	56	3.6	6			KR002
1994 12 01.27	M	10.1	NP	25.6	L	4	45	3	5			MOR
1994 12 01.87	S	10.2	HS	10.0	B		25	1.9	3			HAS02
1994 12 01.89	S	8.8	AC	15.0	R	15	85	3.0	8			DIE02
1994 12 01.92	S	9.2	AC	35	L	5	103	1.5	8			BR004
1994 12 01.96	B	11.0	AC	44.5	L	5	75					SAR02
1994 12 02.21	S	10.4	HS	33.3	L	4	56	2.3	5			KR002
1994 12 02.82				44.5	L	5	289	0.9	7	0.03	340	SAR02
1994 12 02.82				44.5	L	5	289	1.5		0.02	0	SZE02
1994 12 02.82	B	10.9	AC	44.5	L	5	82					SZE02
1994 12 02.82	B	11.1	AC	44.5	L	5	82					SAR02
1994 12 02.82	M	11.4	TI	10	B		25	2	5			ZNO
1994 12 02.84	S	8.7	AC	15.0	R	15	85	3.0	7			DIE02
1994 12 02.91	S	9.4	AC	35	L	5	103	2.0	6/			BR004
1994 12 03.16	S	10.8	AA	20	T	10	81	3.5	2/			SPR
1994 12 03.18	M	11.7	GA	35.9	L	7	85	1.0	4			MOD
1994 12 03.27	M	10.5	NP	25.6	L	4	67	2.6	5			MOR
1994 12 03.80				44.5	L	5	230	1.2	6	0.03	0	SAR02
1994 12 03.80	S	11.2	AC	44.5	L	5	75					KER
1994 12 03.80	S	11.2	AC	44.5	L	5	75					SAR02
1994 12 03.84	S	10.4	HS	44.5	L	5	156	0.6	5			HAS02
1994 12 04.17	S	10.9	AA	20	T	10	81	4.0	1/			SPR
1994 12 04.49	S	11.0	HS	25	L	4	84	1.5				KON03
1994 12 05.84	S	10.1	AC	10.0	B		25	1.8	4			HAS02
1994 12 06.06	S	9.6	HS	20	R	14	155	1.4	4			SHA02
1994 12 06.07	S	10.0:		20	R	14	40	1.5	3			LAN03
1994 12 06.11	S	8.9	AC	15.0	R	15	85	2.0	7			DIE02
1994 12 06.50	S	10.2	AC	20	L	6	67	1.3	4			YAS
1994 12 06.82	S	10.1	AC	10.0	B		25	2.9	3			HAS02
1994 12 06.89	S	9.1	AC	15.0	R	15	85	2.0	7			DIE02
1994 12 06.90	S	9.3	AC	35	L	5	103	2.0	5			BR004
1994 12 06.90	S	10.7	AC	20.3	T	10	62	1.5	3			GAR02
1994 12 07.96	S	9.2	AC	15.0	R	15	85	2.0	6			DIE02
1994 12 08.26	M	10.5	NP	25.6	L	4	67	1.6	4			MOR
1994 12 09.15	S	10.6	AA	20	T	10	81	1.5	3/			SPR
1994 12 09.98	S	9.3	AC	15.0	R	15	85	1.5	5			DIE02
1994 12 10.33	M	10.8	NP	25.6	L	4	67		4			MOR
1994 12 18.19	J	12.3	SC	25	T	4		& 0.36	8/	&0.01	9	ROQ
1994 12 21.11	J	11.2	SC	25	T	4		& 0.35	8	&0.02	296	ROQ
1994 12 22.84	S	10.4	AC	15.0	R	15	85	1.5	4			DIE02
1994 12 23.87	S	10.6	AC	15.0	R	15	85	1.5	4			DIE02
1994 12 25.28	S	10.9	AA	20	T	10	113	1.5	2			SPR

Comet 2P (Encke) [= 1980 XI]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1980 11 14.20	S	6.4	AA	5.0	B		7	10	4			MIL02
1994 01 11.74	S	8.0	A	12.0	R		20	3.5	5			LOO01
1994 01 12.76	M	8.5	NP	30	L	5	60	4				POP

Comet 71P (Clark) [= 1994t]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 12 05.86	a C	17.5	GA	60.0	Y	6		0.35			250	NAK01
1994 12 06.85	a C	17.6:	GA	60.0	Y	6		0.35				NAK01

Comet 9P (Tempel 1) [= 1983 XI = 1993c]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1983 04 12.92	S	11.0	AC	29.8	L	5	62	1.3	8	0.05	237	KEI
1983 04 15.95	S	10.6	AC	29.8	L	5	62	1.0	7	0.05	214	KEI
1983 05 08.99	S	10.5	AC	29.8	L	5	62	1.7	3			KEI
1983 05 11.00	S	10.4	AC	29.8	L	5	62	2.2	3/	0.03	200	KEI
1983 06 01.96	S	10.6	AC	29.8	L	5	62	1.4	5			KEI
1983 06 14.96	S	10.4	AC	29.8	L	5	62	1.2	4			KEI
1994 03 05.02	B	13.0	VF	25	L	6	75	2	4			REN
1994 03 06.01	S	11.4	AC	15.0	B		25	1.7				KEI
1994 03 09.06	B	13.0	VF	25	L	6	75	2.5	4/			REN
1994 03 10.88	S	11.3	AC	15.0	B		25	1.5	2			KEI
1994 03 11.98	S	11.2	HS	15.0	B		25	3.0	3			KEI
1994 03 17.05	S	11.3	AC	15.0	B		25	1.8	4			KEI
1994 03 20.08	S	11.2	AC	15.0	B		25	1.8	3/			KEI
1994 04 01.93	S	10.2	AC	10.0	B		20	4.0	4			KEI
1994 04 05.99	S	10.3	AC	10.0	B		20	2.5	6			KEI
1994 04 07.96	B	11.1	VF	12	L	6	40	3	5			REN
1994 04 08.00	S	10.1	AC	10.0	B		20	2.5	5/			KEI
1994 04 08.97	S	10.0	AC	10.0	B		20	3.7	6			KEI
1994 04 10.90	S	10.0	AC	10.0	B		20	3.7	5/			KEI
1994 04 10.95	B	11.0	VF	12	L	6	40	3	5			REN
1994 04 11.90	B	11.1	VF	25	L	6	75	2.25	6/			REN
1994 04 11.94	B	11.0	VF	12	L	6	40	3	5			REN
1994 04 12.94	S	10.1	AC	10.0	B		20	2.5	6/			KEI
1994 04 14.97	B	11.1	VF	12	L	6	40	3.5	6		150	REN
1994 04 17.43	S	9.7	S	20	T	10	100	2.2	3			PRY
1994 04 27.89	M	9.6	NP	30	L	5	60	3				POP
1994 04 27.90	B	10.7	VF	12	L	6	40	2.5	6/			REN
1994 04 28.89	M	10.6	TI	20	R	17	87	2	3/			LEH
1994 04 29.84	M	11.6	TI	20	R	17	87	2	3			LEH
1994 04 30.94	S	9.5	AC	10.0	B		20	2.0	6/			KEI
1994 05 04.89	M	10.3	NP	30	L	5	60	2				POP
1994 05 04.97	S	9.0	S	7.0	B		10	8.1	2			DEA
1994 05 06.02	S	8.9	S	7.0	B		10	8.1	3			DEA
1994 05 06.90	M	10.7	TI	10.0	B	4	25	4	3			LEH
1994 05 06.93	B	10.5	VF	12	L	6	40	3.5	6			REN
1994 05 07.38	S[	9.5	AA	8.0	B		15					SEA01
1994 05 07.93	S	9.1	AA	10.0	B		20	2.9	5/			KEI
1994 05 07.97	S	8.9	S	7.0	B		10	8.1	4			DEA
1994 05 08.10	S	9.8	AC	25.4	L	6	71	1.5	3			VIE
1994 05 08.88	M	10.0	TI	10.0	B	4	25	5	3			LEH
1994 05 08.94	B	10.4	VF	12	L	6	40	3.5	6			REN
1994 05 08.99	S	9.0	S	7.0	B		10	8.0	3			DEA
1994 05 10.95	S	8.9	S	7.0	B		10	10.8	3			DEA
1994 05 11.45	S	9.4	AA	8.0	B		15	3	5			SEA01
1994 05 11.48	S	9.4	AA	5.0	B		10	4	2			SEA01
1994 05 11.86	M	9.7	TI	10.0	B	4	25	5	4/			LEH
1994 05 12.94	S	8.9	AA	5.0	B		10	5.8				KEI
1994 05 14.95	S	9.1	AA	10.0	B		20	2.9	6			KEI
1994 05 15.14	S	10.0	AC	25.4	L	6	71	1.5	3			VIE
1994 05 18.03	B	10.1	VF	12	L	6	40	5	6			REN
1994 05 20.27	S	9.5	AC	11.4	L	8	40	4	3			VIE
1994 05 30.02	S	9.2	S	7.0	B		10	4.5	2			DEA
1994 06 01.85	M	9.0	S	10.0	B	4	25	7	2			LEH
1994 06 03.99	M	8.5	S	10.0	B	4	25	6	4			LEH
1994 06 04.94	S	9.3	AA	10.0	B		20	3.2	4			KEI
1994 06 05.30	S	9.4	S	20	T	10	100	2.0	3			PRY
1994 06 06.92	B	10.6	VF	12	L	6	40	5.5	3			REN

Comet 9P (Tempel 1) [= 1983 XI = 1993c] (cont.)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 06 07.03	S	9.0	S	7.0	B		10	5.0	5			DEA
1994 06 08.91	M	9.0	S	10.0	B	4	25	5	4			LEH
1994 06 08.97	B	10.3	VF	40	L	4	50	2.5	3			REN
1994 06 09.45	S	9.4	AA	8.0	B		15	2	2			SEA01
1994 06 10.42	B	8.9	AA	5.0	B		10	3	7			SEA01
1994 06 10.42	S	9.0	AA	8.0	B		15	3	6			SEA01
1994 06 11.42	B	8.9	AA	5.0	B		10		3			SEA01
1994 06 11.93	B	10.5	VF	12	L	6	40	3.25	4			REN
1994 06 12.01	S	9.0	S	7.0	B		10	4.0	4			DEA
1994 06 26.35	B	8.6	AA	5.0	B		10	4	6			SEA01
1994 06 26.35	B	8.7	AA	8.0	B		15	3	6			SEA01
1994 06 28.43	B	8.6	AA	5.0	B		10					SEA01
1994 06 28.43	S	8.8	AA	8.0	B		15					SEA01
1994 06 29.39	B	9.1	AA	8.0	B		15	3	4			SEA01
1994 06 29.39	S	9.0	AA	5.0	B		10					SEA01
1994 07 01.17	& S	11.2	GA	20.0	L	5	68	1.0	2			MOD
1994 07 04.42	S[	9.8	AA	8.0	B		15					SEA01
1994 07 07.18	c	17.5	FA	91.4	L	5						SCO01
1994 07 07.20	C	12.2	FA	91.4	L	5		9.77				SCO01
1994 07 10.18	C	12.8	FA	91.4	L	5		12.39		0.17	108	SCO01
1994 07 10.18	c	17.4	FA	91.4	L	5						SCO01
1994 07 10.27	S	10.3	S	20	T	10	100	2.5	2			PRY
1994 07 11.16	& S	11.6	GA	20.0	L	5	68	1.1	1/			MOD
1994 07 12.13	S	11.8	GA	20.0	L	5	68	1.2	1/			MOD
1994 08 03.48	C	12.5	FA	91.4	L	5						SCO01
1994 08 26.46	a C	13.0	GA	60.0	Y	6		1.35			120	NAK01
1994 09 25.43	a C	13.2	GA	60.0	Y	6		1.3				NAK01
1994 10 24.41	a C	13.9	GA	60.0	Y	6		0.8				NAK01
1994 11 04.41	a C	14.1:	GA	60.0	Y	6		1.1				NAK01
1994 11 06.40	a C	14.0	GA	60.0	Y	6		1.3				NAK01
1994 11 23.39	a C	14.5	GA	60.0	Y	6		1.1				NAK01
1994 12 04.40	a C	14.6	GA	60.0	Y	6		1.15				NAK01

Comet 10P (Tempel 2)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 07 19.35	S[	13.3	GA	35.9	L	7	164	! 0.5				MOD
1994 10 02.75	C	16.6	GA	60.0	Y	6		0.5				NAK01
1994 10 14.77	C	16.1	GA	60.0	Y	6		0.8				NAK01
1994 10 31.79	C	16.7	GA	60.0	Y	6		0.55		0.06	253	NAK01
1994 11 08.71	C	16.3	GA	60.0	Y	6		0.75				NAK01
1994 11 24.54	C	16.3	GA	60.0	Y	6		0.75				NAK01

Comet 19P (Borrelly) [= 1994l]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 08 07.38	S[	12.4	GA	35.9	L	7	164	! 0.5				MOD
1994 08 16.38	S	12.8	GA	35.9	L	7	85	0.7	1/			MOD
1994 08 17.97	S	11.3	PC	48.0	L	5	65	4.2	5			CHE03
1994 08 18.96	B	11.4	PC	48.0	L	5	65	4.3	5			CHE03
1994 08 19.96	S	11.5:	PC	48.0	L	5	65	4.0	5			CHE03
1994 08 31.97	S	10.5:	PC	11.0	B	4	20	3	1			CHE03
1994 09 01.97	S	10.7:	PC	11.0	B	4	20	3	1			CHE03
1994 09 02.93	B	10.6	PC	48.0	L	5	65	4.5	5			CHE03
1994 09 04.08	S	10.6:	TI	11	L	8	32	2	3			KYS
1994 09 04.39	M	12.0	GA	35.9	L	7	85	0.9	3			MOD
1994 09 06.10	S	10.2	AC	20.0	T	10	78	4	1			COM
1994 09 08.38	M	11.5	GA	35.9	L	7	85	1.0	2/			MOD
1994 09 11.39	M	11.4	GA	35.9	L	7	85	1.3	3			MOD
1994 09 12.36	S	10.3	AC	31.7	L	6	68	2.3	5			BOR
1994 09 12.39	M	11.4	GA	35.9	L	7	85	1.3	3/			MOD
1994 09 13.12	S	10.4	AC	20.0	L	4	80	3	1			SCH04
1994 09 13.15	S	9.5	AA	12.0	B		20		5			LOO01

Comet 19P (Borrelly) [= 1994I] (cont.)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR		COMA	DC	TAIL	PA	OBS.
1994 09 17.11	S	9.7	S	30	R	18	95		1.5	2			LAN03
1994 09 17.11	S	11.0	HS	30	R	18	95		1.5	2			LAN03
1994 09 18.13	M	9.6:	TI	13	L	8	69		2.5	3/			HOR02
1994 09 18.40	M	11.4	GA	35.9	L	7	85		1.1	3			MOD
1994 09 27.12	S	10.6	AC	30	R	18	95		2	3			LAN03
1994 09 30.42	M	10.9	GA	35.9	L	7	85		1.0	3			MOD
1994 09 30.42	S	9.5:	HS	33.3	L	4	56		3.0	4			KR002
1994 09 30.66	S	9.7	AA	10.0	B		25						SEA
1994 10 01.50	Y	9.2	SC	25	T	4		&	0.99	7/			ROQ
1994 10 02.01	B	8.9	S	25	L	4	33		9	4			KRY01
1994 10 03.06	M	8.8	S	25	L	4	33		8	5			KRY01
1994 10 03.41	M	10.3	GA	35.9	L	7	85		1.2	4			MOD
1994 10 03.64	S	9.1	AA	10.0	B		25						SEA
1994 10 03.97	B	8.9	S	25	L	4	33		8	5			KRY01
1994 10 04.12	S	9.4	S	20	R	14	40		2.1	3			SHA02
1994 10 04.16	S	10.1	S	20	R	14	40		4	4			LAN03
1994 10 04.93	S	8.9	S	15	L	4	20		9	4			KRY01
1994 10 05.08	S	9.5	S	20	R	14	40		4	3			LAN03
1994 10 05.10	M	10.5	TI	11	L	8	32		2	3/			KYS
1994 10 05.15	M	8.6	TI	13	L	8	69		2.5	3			HOR02
1994 10 05.15	S	9.7	A	25.2	L	4	53		4.5	5			LOO01
1994 10 05.41	S	9.3	HS	33.3	L	4	56		2.4	4			KR002
1994 10 06.10	B	9.3	CS	12.7	T	10	50		2	5			GAR02
1994 10 06.11	M	8.7	TI	13	L	8	69		2.5	3/			HOR02
1994 10 06.13	S	10.6	TI	11	L	8	32		2.2	4			KYS
1994 10 06.91	S	9.0	S	25	L	4	33		5	4			KRY01
1994 10 07.11	S	10.0	TI	11	L	8	32		2.2	4/			KYS
1994 10 07.16	S	8.9	AC	20.0	L	4	42		3	6			SCH04
1994 10 07.39	M	10.1	GA	35.9	L	7	85		1.3	4			MOD
1994 10 07.41	M	9.7	GA	20.0	L	5	35		1.8	3/			MOD
1994 10 08.14	S	8.7	AC	20.0	L	4	42	&	5	6			SCH04
1994 10 08.45	Y	9.5	SC	25	T	4		&	1.03	6/	&0.02	90	ROQ
1994 10 09.01	B	8.8	S	25	L	4	33		5	4			KRY01
1994 10 09.93	B	9.0	S	15	L	4	20		7	4			KRY01
1994 10 10.07	B	9.7	AA	15.6	L	10	54		6	3			KOS
1994 10 10.16	S	9.3	AC	20	R	14	40		3.1	2			SHA02
1994 10 10.19	S	8.8	S	20	R	14	40		4	3			LAN03
1994 10 10.20	S	9.3	S	33.3	L	5	85		2.3	4			SHA02
1994 10 10.22	S	9.0	S	7.0	B		10		4.0	1			DEA
1994 10 11.13	B	9.7	AA	15.6	L	10	54		6	3			KOS
1994 10 11.15	S	11.2	A	25.2	L	4	53			3			LOO01
1994 10 11.40	M	9.7	GA	20.0	L	5	35						MOD
1994 10 11.40	S	9.6	GA	20.0	L	5	35		2.0	3			MOD
1994 10 11.40	Y	9.2	SC	25	T	4		&	1.25	6	?	96	ROQ
1994 10 12.14	B	9.7	AA	15.6	L	10	54		6	3			KOS
1994 10 12.16	S	10.4	A	25.2	L	4	53		2	4			LOO01
1994 10 12.18	S	8.5:	S	10.0	B		25		2.3	4			HAS02
1994 10 12.43	S	9.5	GA	20.0	L	5	35		2.4	3			MOD
1994 10 13.13	B	9.6	AA	15.6	L	10	54		7	2			KOS
1994 10 13.83	S	8.5	S	15.0	R	5	25		3.5	4/			NAG02
1994 10 14.79	S	8.7	S	15.0	R	5	25		3	4			NAG02
1994 10 15.08	S	9.2	AA	19.2	L	8	33	&	3	4			MIL02
1994 10 15.14	S	9.6	AA	25.2	L	4	53			3			LOO01
1994 10 15.15	S	8.8	AC	20.0	L	4	42		4	5/			SCH04
1994 10 15.15	S	9.0	AA	10.0	B		25		1.8	4			HAS02
1994 10 16.10	S	9.3	AC	30.5	L	5	117		2	8			VIC
1994 10 18.04	M	8.8	TI	35	L	5	92		3	4			HOR02
1994 10 18.19	S	9.7	AA	25.2	L	4	53		3	4			LOO01
1994 10 19.14	B	9.4	AA	15.6	L	10	54		8	4			KOS
1994 10 22.47	Y	7.8	SC	25	T	4		&	1.49	8	?	94	ROQ
1994 10 24.81	S	8.6	S	15.0	R	5	25		3	5			NAG02
1994 10 28.03	S	8.8	AA	30	R	18	95		1.4	3			SHA02
1994 10 28.07	S	8.8	AA	20	R	14	40		4	4			LAN03

Comet 19P (Borrelly) [= 1994l] (cont.)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 10 28.13	B	9.0	AA	6.3	R	13	52	8	6			KOS
1994 10 28.99	S	8.0	AC	15.0	R	15	85	5.0	3			DIE02
1994 10 29.02	S	7.7	AA	35	L	5	103	8	7			BRO04
1994 10 29.34	M	7.9:	NP	25.6	L	4	45	2.6	5	0.20	158	MOR
1994 10 29.42	Y	7.5	SC	25	T	4		& 1.60	8/	?1.30	93	ROQ
1994 10 29.74	S	8.7	HS	41.0	L	5	73	2.7	6	0.1	86	KOB01
1994 10 29.79	S	8.5	S	15.0	R	5	25	3.5	5/			NAG02
1994 10 30.36	M	7.9	NP	25.6	L	4	45		7/	0.33	158	MOR
1994 10 30.36	M	8.0	NP	8.0	B		20		7			MOR
1994 10 30.74	C	9.1	GA	8.0	R	6		10.2		0.37	260	NAK01
1994 10 31.75	S	8.3	HS	41.0	L	6	80	4.2	6	0.1	89	KOB01
1994 10 31.80	S	8.6	S	15.0	R	5	25	3.5	5			NAG02
1994 10 31.94	M	9.3	TI	35	L	5	92	3	4/			HOR02
1994 11 01.08	S	8.7	AA	20	R	14	40	6	5	0.25	210	LAN03
1994 11 01.12	B	8.7	AA	15.6	L	10	54	9	8			KOS
1994 11 01.14	S	8.6	AA	33.3	L	5	55	3.0	5	0.03	112	SHA02
1994 11 01.17	S	8.5	AA	8.0	B		10	4.7	3			SHA02
1994 11 02.00	S	8.9	AA	10	B		20	2.5	3			SHA02
1994 11 02.11	B	8.9	AA	15.6	L	10	54	9	5			KOS
1994 11 02.11	S	8.1	AC	15.0	R	15	85	5.0	8			DIE02
1994 11 02.16	S	9.0	AA	25.2	L	4	53	3	5			LOO01
1994 11 03.30	M	9.1	NO	20.0	L	5	35	3.1	3/			MOD
1994 11 03.31	S	8.6	NO	5.0	B		10	5.8	1			MOD
1994 11 03.82	S	8.5	S	15.0	R	5	25	4	5/			NAG02
1994 11 04.13	S	8.1	AC	15.0	R	15	85	5.0	7			DIE02
1994 11 05.05	M	7.3	NP	30	L	5	40					POP
1994 11 06.40	Y	7.9	SC	25	T	4		& 1.45	7	?1.77	92	ROQ
1994 11 06.79	S	8.4	S	15.0	R	5	25	4	5			NAG02
1994 11 07.00	S	8.4	AA	15	L	5	25	4	5/	&0.07	180	ZAN
1994 11 07.05	B	8.8	AA	15.6	L	10	54	7	6			KOS
1994 11 07.05	S	8.8	AA	10	B		20	5.0	3			SHA02
1994 11 07.75	C	8.9	GA	8.0	R	6		11.8			265	NAK01
1994 11 08.00	S	8.4	AA	15	L	5	25	4	5/	&0.07	180	ZAN
1994 11 08.03	S	8.8	AA	10	B		20	3.8	3			SHA02
1994 11 08.45	M	9.3	NO	20.0	L	5	35	3.0	3/			MOD
1994 11 09.81	S	8.4	S	15.0	R	5	25	4.5	4/			NAG02
1994 11 10.36	Y	7.8	SC	25	T	4		& 1.51	7/	?1.87	92	ROQ
1994 11 10.75	S	9.0	HS	25	L	4	42	& 4	4/	0.03	275	KON03
1994 11 11.36				35.9	L	7	85	2.2	5	0.02	274	MOD
1994 11 11.40	M	9.3	NO	20.0	L	5	35	3.0	4			MOD
1994 11 12.45	M	9.3	NO	20.0	L	5	35	2.9	3/			MOD
1994 11 12.50	M	7.9	NP	8.0	B		20	8	5			MOR
1994 11 14.80	S	8.3	S	15.0	R	5	25	4.5	4/			NAG02
1994 11 16.18	S	8.4	AA	10	B		20	3.8	5		90	SHA02
1994 11 17.09	S	8.5	AA	20	R	14	40	2.8	4			SHA02
1994 11 23.83	S	8.4	S	15.0	R	5	25	4	5			NAG02
1994 11 24.79	B	8.5	S	8.0	B		10	12	4			KRY01
1994 11 24.98	S	8.0	HD	20.3	T	10	80	5.0	3			GRA04
1994 11 25.83	S	8.4	S	15.0	R	5	25	5	4			NAG02
1994 11 25.91	B	8.5	AA	15.6	L	10	54	10	5			KOS
1994 11 26.82	S	8.5	S	15.0	R	5	25	5	4/			NAG02
1994 11 26.91	B	8.5	AA	15.6	L	10	54	10	4			KOS
1994 11 26.97	S	9.2	AA	30.5	L	5	117	4.5	6	0.2	270	VIC
1994 11 28.04	S	8.0	HD	6.0	R	4	15	5				GRA04
1994 11 28.05	M	8.2	HD	20.3	T	10	80	4.7	5			GRA04
1994 11 28.25	S	7.8	AA	20	T	10	102	4.5	4			SPR
1994 11 28.28	S	8.1	S	8.0	B		20	7	2			MOR
1994 11 29.17	S	8.6	S	33.3	L	4	56	1.6	6	0.06	98	KRO02
1994 11 29.83	S	8.4	S	15.0	R	5	25	4.5	4/			NAG02
1994 11 29.94	S	8.3	AC	15.0	R	15	85	3.0	8			DIE02
1994 11 30.04	S	8.4	AC	20.0	R	9	51	5.0	8	6	283	CAN03
1994 11 30.16	S	8.5:	S	33.3	L	4	56		6	0.05		KRO02
1994 11 30.31	J	8.9	SC	25	T	4		& 1.45	6/			ROQ

Comet 19P (Borrelly) [= 1994l] (cont.)

DATE (UT)		MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 11 30.65		M	8.1	S	16.0	W	4	19					TSU02
1994 11 30.83		M	8.4	TI	10	B		25	5.5	3	0.15		ZNO
1994 11 30.91		B	8.4	AA	15.6	L	10	54	10	6			KOS
1994 11 30.93		S	8.4	AA	6.0	B		20	5	6	0.25	290	SAR02
1994 11 30.93		S	8.4	AC	15.0	R	15	85	3.0	8			DIE02
1994 11 30.97		S	9.2	AA	30.5	L	5	117	5	5	0.25	270	VIC
1994 11 30.99	!	V	9.0	YF	20.0	T	2		&10	7	0.5	270	MIK
1994 12 01.22		S	8.6	S	8.0	B		20	6	5			KR002
1994 12 01.22		S	9.0	S	33.3	L	4	56	1.9	6	0.06	91	KR002
1994 12 01.25		M	8.3	AA	7.6	R	12	38	5	3			AUG
1994 12 01.29		S	7.9	NP	8.0	B		20	7	2			MOR
1994 12 01.86		S	8.5	AC	10.0	B		25	3.8	4			HAS02
1994 12 01.90		S	8.4	AC	15.0	R	15	85	3.0	7			DIE02
1994 12 01.93		M	8.6	TI	5.0	B		7					APF
1994 12 01.94		S	8.6	AC	35	L	5	103	3.5	6			BR004
1994 12 01.98		S	8.3	AA	6.0	B		20	7	4			SAR02
1994 12 02.06					44.5	L	5	230	2	7	0.25	300	SAR02
1994 12 02.22		S	8.3	S	8.0	B		20	8	4			KR002
1994 12 02.22		S	8.9	S	33.3	L	4	56	2.3	6	0.06	88	KR002
1994 12 02.86		M	8.5	TI	10	B		25	4	3	0.10		ZNO
1994 12 03.04		B	8.9	AA	44.5	L	5	75	2	7	0.35	290	SAR02
1994 12 03.13		S	8.5	AC	15.0	R	15	85	3.0	8			DIE02
1994 12 03.22		S	8.1	AA	20	T	10	64	4.0	3/			SPR
1994 12 03.29		S	8.1	NP	8.0	B		20	7	2			MOR
1994 12 03.35		S	9.1	GA	5.0	B		10	5.0	2			MOD
1994 12 03.82					44.5	L	5	230	1.5	7/	0.15	270	SAR02
1994 12 03.82		S	8.5:	AA	44.5	L	5	75					SAR02
1994 12 04.01		S	8.3	NP	8.0	B	5	20	4	4	0.4	269	MIL02
1994 12 04.05		S	8.4	NP	8.0	B	5	20					TOM01
1994 12 04.22		S	8.2	AA	20	T	10	64	3.5	4			SPR
1994 12 04.82		S	8.5	S	15.0	R	5	25	5	4			NAG02
1994 12 04.93		S	8.1	AA	10	B		20	6.7	2			SHA02
1994 12 04.99		S	8.1	AA	33.3	L	5	55	4.5	4	0.07	90	SHA02
1994 12 05.85		B	8.3	S	8.0	B		10	12	5			KRY01
1994 12 05.98		M	8.4	TI	5.0	B		7					APF
1994 12 06.02		S	8.0	AA	8.0	B		10	6.3	2			SHA02
1994 12 06.02		S	8.3	AA	20	R	14	40	5	4	0.10	250	LAN03
1994 12 06.03		S	8.2	AA	20	R	14	40	5.6	4		100	SHA02
1994 12 06.08		S	8.4	AC	15.0	R	15	85	3.0	8			DIE02
1994 12 06.83		B	9.0	S	12.0	L	6	42	& 4	6/			MIN01
1994 12 06.85		M	8.2	S	16.0	W	4	19					TSU02
1994 12 06.90		S	8.5	AC	15.0	R	15	85	3.0	8			DIE02
1994 12 06.92		S	7.7	AA	10.0	B		25	4.4	4			HAS02
1994 12 07.01		S	8.4	AC	15.0	R	15	85	3.0	8			DIE02
1994 12 07.02		B	8.6	S	8.0	B		11	5	4	0.33	283	GAR02
1994 12 07.06		B	8.5	S	8.0	B		10	12	5			KRY01
1994 12 07.06		S	8.1	AC	35	L	5	49	7	7			BR004
1994 12 07.77		S	9.2	S	12.0	L	6	42	& 5	4/			MIN01
1994 12 08.29		M	8.1	NP	8.0	B		20	6	3			MOR
1994 12 09.26		S	8.5	AA	20	T	10	64	5.0	3/			SPR
1994 12 09.86		S	8.6	S	15.0	R	5	25	6	3/			NAG02
1994 12 09.98		S	8.2	AC	15.0	R	15	85	5.0	8			DIE02
1994 12 10.35		M	8.2:	S	8.0	B		20		3			MOR
1994 12 10.76		S	8.8	HS	25	L	4	84	2.5	5	0.03	120	KON03
1994 12 11.12		S	7.9	AC	40	Y	8	107	3.5	3			DAM
1994 12 11.12		S	7.9	AC	40	Y	8	107	3.5	4			FOG
1994 12 13.83		S	8.8	S	15.0	R	5	25	5	4			NAG02
1994 12 14.18		S	8.1	AC	15.0	R	15	85	5.0	8			DIE02
1994 12 15.20	!	V	9.2	YF	20.0	T	2		&11	7	0.6	270	MIK
1994 12 16.84		S	9.0	S	15.0	R	5	25	5	4			NAG02
1994 12 23.90		S	8.6	AC	15.0	R	15	85	3.0	6			DIE02
1994 12 25.27		S	8.7	AA	20	T	10	64	3.0	3/			SPR

Comet 31P (Schwassmann-Wachmann 2)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 01 10.02	S	12.5	AA	25.2	L	4	53	0.5	8			L0001
1994 05 08.93	M	12.5	NP	30	L	5	150	0.7				POP
1994 06 01.88	M	11.8	TI	20	R	17	87	1	2			LEH
1994 06 08.89	M	12.2	HS	20	R	17	140	1	2/			LEH
1994 06 12.87	M	12.3	HS	20	R	17	280	0.5	2			LEH

Comet 44P (Reinmuth 2) [= 1993g]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 07 12.35	S[	14.0	GA	35.9	L	7	164	! 0.5				MOD
1994 08 08.35	S[	14.1	GA	35.9	L	7	164	! 0.5				MOD
1994 08 16.34	S	14.9	GA	35.9	L	7	164	0.25	3			MOD
1994 09 03.12	B	14 :	EC	62	T	15	160	0.6	6			REN
1994 09 04.32	S[	14.5	GA	35.9	L	7	164	! 0.5				MOD
1994 09 08.34	S	14.5	GA	35.9	L	7	164	0.30	1/			MOD
1994 09 10.19	S	13.5	HS	33.3	L	4	201	0.5	3			KR002
1994 09 10.35	S	14.6	GA	35.9	L	7	164	0.40	1			MOD
1994 09 11.30	S	14.5	GA	35.9	L	7	164	0.55	1/			MOD
1994 09 12.30	S	14.5	GA	35.9	L	7	164	0.50	1			MOD
1994 09 29.92	B	13.8	EC	40	L	4	90	1	4			REN
1994 10 03.26	S[	14.3	GA	35.9	L	7	164	! 0.5				MOD
1994 10 05.98	S[	13.5	AC	20.3	T	10	80	! 0.5				GAR02
1994 10 06.02	B	14.3	EC	40	L	4	90	1	4			REN
1994 10 07.23	S	14.3	GA	35.9	L	7	164	0.45	2			MOD
1994 10 11.27	S	14.1	GA	35.9	L	7	164	0.6	3			MOD
1994 10 11.29	S	13.9	GA	35.9	L	7	85	0.75	2			MOD
1994 10 12.27	S	13.8	GA	35.9	L	7	164	0.55	2/	?	270	MOD
1994 10 15.37	S	14.1	GA	35.9	L	7	164	0.5	2			MOD
1994 10 28.17	S	13.7	GA	35.9	L	7	85	0.8	1/			MOD
1994 10 30.52	C	13.8	GA	60.0	Y	6		1.45		0.04	236	NAK01
1994 10 30.53	C	13.8	HS	20.0	L	6		0.9				IT002
1994 10 31.81	M	13.7	HS	35	L	5	92	1.5	3			HOR02
1994 11 01.84	M	13.4	HS	35	L	5	92	2.0	2			HOR02
1994 11 04.55	C	14.2	HS	20.0	L	6		0.9				IT002
1994 11 08.12	S	14.0	GA	35.9	L	7	85	0.6	1			MOD
1994 11 08.64	C	13.7	GA	60.0	Y	6		1.8		0.06	237	NAK01
1994 11 11.27	S	14.0	GA	35.9	L	7	85	0.75	0			MOD
1994 11 11.28	S	14.1	GA	35.9	L	7	164	0.55	1/			MOD
1994 11 23.50	C	14.0	GA	60.0	Y	6		1.8			232	NAK01
1994 12 02.82	S[	14.5	HS	44.5	L	5	156					HAS02
1994 12 03.07	S[	14.4	GA	35.9	L	7	164	! 0.5				MOD
1994 12 03.76	! V	15.0	YF	20.0	T	2		1.5	6			MIK
1994 12 06.42	C	14.6	GA	60.0	Y	6		1.35				NAK01

Comet 51P (Harrington) [= 1994g]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 08 16.37	S[	14.3	GA	35.9	L	7	164	! 0.5				MOD
1994 09 10.37	S	14.2	GA	35.9	L	7	164	0.50	2			MOD
1994 09 11.37	S	13.9	GA	35.9	L	7	164	0.50	2			MOD
1994 09 12.35	S	14.2	GA	35.9	L	7	164	0.50	2			MOD
1994 10 06.03	S	12.4	AC	20.3	T	10	80	0.7	3			GAR02
1994 10 07.33	M	13.3	GA	35.9	L	7	85	0.7	2			MOD
1994 10 07.33	M	13.4	GA	35.9	L	7	164	0.6	3/			MOD
1994 10 09.56	S	12.4	GA	25.4	L	4	114					SEA
1994 10 11.33	S	13.2	GA	35.9	L	7	85	0.8	2/			MOD
1994 10 12.31	S	13.4	GA	35.9	L	7	85	0.75	2/			MOD
1994 10 15.35	S	13.5	GA	35.9	L	7	85	0.75	1/			MOD
1994 10 27.13	S	12.7	HS	33.3	L	4	201	1.1	3			KR002
1994 10 28.15	S	12.9	HS	33.3	L	4	201	1.1	2			KR002
1994 10 28.20	M	13.8	GA	35.9	L	7	85					MOD
1994 10 28.20	S	13.7	GA	35.9	L	7	85	0.75	2			MOD
1994 10 29.23	S	11.9	NP	25.6	L	4	111	2.2	2/			MOR

Comet 51P (Harrington) [= 1994g] (cont.)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR		COMA	DC	TAIL	PA	OBS.
1994 10 30.22		S 13.0	NP	25.6	L	4	111		1.3	0/			MOR
1994 10 30.53		C 13.3	GA	60.0	Y	6			1.55			315	NAK01
1994 11 04.57		C 14.4	HS	20.0	L	6			0.9				IT002
1994 11 08.21		S 13.8	GA	35.9	L	7	85		0.7	0/			MOD
1994 11 08.63		C 13.7	GA	60.0	Y	6			1.6			350	NAK01
1994 11 11.30		S[13.4	GA	35.9	L	7	164	!	0.6				MOD
1994 11 12.29		S[13.8	GA	35.9	L	7	164	!	0.6				MOD
1994 11 23.51		C 14.4	GA	60.0	Y	6			1.45			35	NAK01
1994 12 02.83		S[14.5	HS	44.5	L	5	156						HAS02
1994 12 03.09		S[14.2	GA	35.9	L	7	164	!	0.5				MOD
1994 12 03.78	!	V 14.7	YF	20.0	T	2		&	2	2			MIK
1994 12 04.52		C 15.1	GA	60.0	Y	6			1.05			45	NAK01
1994 12 06.43		C 15.4	GA	60.0	Y	6			1.05		0.02	45	NAK01
1994 12 06.89		S[13.0	AC	20.3	T	10	167	!	0.5				GAR02

Comet 51P (Harrington) [= 1994g] component A

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 10 01.69		C 13.7	FA	91.4	L	5						SC001
1994 10 04.40		c 17.3	FA	91.4	L	5		1.3		0.17	272	SC001
1994 10 04.41		C 12.8	FA	91.4	L	5						SC001
1994 10 05.40		c 17.5	FA	91.4	L	5		1.50		0.12	274	SC001
1994 10 05.41		C 12.8	FA	91.4	L	5						SC001

Comet 51P (Harrington) [= 1994g] component B

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 10 04.40		c 22.5	FA	91.4	L	5						SC001
1994 10 04.41		C 21.3	FA	91.4	L	5						SC001
1994 10 05.40		C 21.2	FA	91.4	L	5						SC001

Comet 51P (Harrington) [= 1994g] component C

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 06 13.42		C 21.9	FA	91.4	L	5				>0.01	262	SC001
1994 10 04.40		c 21.5	FA	91.4	L	5		0.18		&0.02	269	SC001
1994 10 04.41		C 20.2	FA	91.4	L	5						SC001
1994 10 05.40		c 22.3	FA	91.4	L	5		0.33		&0.02	264	SC001
1994 10 05.41		C 20.0	FA	91.4	L	5						SC001
1994 11 09.28		c 18.3	FA	91.4	L	5						SC001
1994 11 09.29		C 13.8	FA	91.4	L	5						SC001
1994 11 09.33		C 14.1	FA	91.4	L	5						SC001

Comet 77P (Longmore) [= 1994q]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 11 08.84		C 19.7	GA	60.0	Y	6		0.2				NAK01
1994 12 05.82		C 19.0	GA	60.0	Y	6		0.25			295	NAK01

Comet 103P/1991 N1 (Hartley 2) [= 1991 XV]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1991 08 10.10		S 8.4	AA	10.0	B		20	3.1	4/			KEI
1991 08 15.10		S 8.4	AA	5.0	B		10	3.4				KEI
1991 08 15.10		S 8.4	AA	10.0	B		20	3.4	4	0.33	307	KEI
1991 08 17.11		S 8.0	AA	5.0	B		10	3.2	3			KEI
1991 08 18.11		S 8.0	AA	5.0	B		10	5.8	4			KEI
1991 08 19.11		S 8.0	AA	10.0	B		20		4/		270	KEI
1991 08 19.11		S 8.1	AA	5.0	B		10	5.1				KEI
1991 08 21.13		S 8.3	AA	3.2	B		6	2				KEI
1991 08 21.13		S 8.3	AA	5.0	B		10	2.7				KEI
1991 08 24.15		S 8.1	AA	5.0	B		10	3.3	3			KEI
1991 09 07.15		S 7.9	AA	5.0	B		10	2				KEI

Comet 103P/1991 N1 (Hartley 2) [= 1991 XV] (cont.)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1991 09 07.15	S	7.9	AA	10.0	B		20	2.3	5/	0.13	289	KEI
1991 09 08.16	S	7.9	AA	5.0	B		10	3.8	6/			KEI
1991 09 20.08	O	7.8	NP	5.0	B		7	5				KYS
1991 09 22.10	O	8.0	NP	8	R		17	5				KYS
1991 10 04.10	O	8.5	NP	11	L	8	32	4	3			KYS
1991 10 05.14	O	8.5	NP	5.0	B		7	5				KYS
1991 10 09.10	O	8.8	NP	11	L	8	32	3				KYS
1991 10 14.14	O	8.8	NP	11	L	8	32					KYS
1991 10 17.13	O	8.8	NP	11	L	8	32	4				KYS
1991 11 05.15	O	9.4	NP	11	L	8	32	4	3			KYS
1991 11 07.14	O	9.7	NP	11	L	8	32	4	2			KYS
1991 11 17.22	S	9.5	AA	10.0	B		20	5.3	3			KEI

Comet P/1994 P1 (Machholz 2) [= 1994o] component A

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 08 15.98	S	9.7	AC	20.0	T	10	63	> 3	1/			COM
1994 08 18.06	S	9.0	AC	20.0	T	10	77	& 3	2/			COM
1994 08 26.93	B	8.0	S	11.0	B	4	20	4.2	5			CHE03
1994 08 27.96	M	9.2	NP	30	L	5	60	1.5				POP
1994 08 27.98	B	8.2	S	11.0	B	4	20	4.5	5			CHE03
1994 08 28.34	S	8.7	GA	20	L	8	46	5	0/			DID
1994 08 28.36	S	7.7	HR	8.0	B		20	6	3/			BOR
1994 08 28.92	B	8.1	S	11.0	B	4	20	5.2	5	0.05		CHE03
1994 08 29.96	B	7.7	S	8.0	B	4	10	5.5	5	0.1		CHE03
1994 08 30.36	S	7.6	HR	8.0	B		20	7.5	5			BOR
1994 08 30.39	S	8.7	GA	20	L	8	46	5	7			DID
1994 08 30.96	B	7.6	S	8.0	B	4	10	6.0	5	0.1		CHE03
1994 08 31.98	B	6.9	S	8.0	B	4	10	6.0	8			CHE03
1994 09 01.90	B	7.0	S	8.0	B	4	10	6.0	6			CHE03
1994 09 02.30	S	7.3	SC	20	L	8	46	8	6	0.08	315	DID
1994 09 02.36				31.7	L	6	68	3.5	6	0.1	310	BOR
1994 09 02.36	S	7.0	HR	5.0	B		10	7	6			BOR
1994 09 02.90	B	7.2	S	8.0	B	4	10	6.5	6	0.1		CHE03
1994 09 03.31	S	7.2	SC	20	L	8	46	6	7	0.11	300	DID
1994 09 03.37				31.7	L	6	68	3.7	6	&0.1	310	BOR
1994 09 03.37	S	7.1	HR	5.0	B		10	9	5			BOR
1994 09 03.96	B	7.4:	S	11.0	B	4	20	6.0	5			CHE03
1994 09 03.97	B	7.1	S	5.0	R	5	12		5			CHE03
1994 09 04.99	S	7.5:	S	11.0	B	4	20		5			CHE03
1994 09 05.06	B	7.2	S	8.0	B	4	10	7	4	1.0	315	KRY01
1994 09 05.37	S	6.5	HR	5.0	B		10	7	7			BOR
1994 09 05.39	M	6.9	SC	5.0	B		10	7	2/			MOD
1994 09 06.03	B	7.3	S	8.0	B	4	10	9	3			KRY01
1994 09 06.08	S	7.6	AC	4.0	R		10	& 5	5	&0.2		COM
1994 09 06.37				31.7	L	6	68	3.2	7	0.5	300	BOR
1994 09 06.37	S	6.9	HR	5.0	B		10	7	7			BOR
1994 09 07.09	B	7.8	AA	15.6	L	10	54	10	8			KOS
1994 09 07.35	S	7.4	SC	20	L	8	46	5	7	0.17	350	DID
1994 09 07.35	S	7.4	SC	20	L	8	130					DID
1994 09 07.40	M	8.1	SC	20.0	L	5	35	2.3	2/			MOD
1994 09 08.35	S	7.5	SC	20	L	8	46	5	7	0.01	305	DID
1994 09 08.37	S	7.3	HR	5.0	B		10	6	6			BOR
1994 09 08.41	M	8.5	GA	20.0	L	5	35	2.2	2			MOD
1994 09 08.41	M	9.0	GA	35.9	L	7	85	2.0	2/	0.03	292	MOD
1994 09 08.41	S	8.0:	SC	5.0	B		10	3.5	1/			MOD
1994 09 09.1	M	8.0	AA	6.0	B		20	10	5			CSU
1994 09 09.10	B	8.1	AA	15.6	L	10	54	9	6			KOS
1994 09 10.04	S	8.2	S	6.0	B		20	&10	4			SCI
1994 09 10.40				35.9	L	7	85	1.9	3	0.05	296	MOD
1994 09 10.40	M	8.3	GA	5.0	B		10	7	2			MOD
1994 09 10.41	M	8.9	GA	20.0	L	5	35	2.2	2/			MOD
1994 09 11.02	B	7.9	S	6.0	B	4	20		5			CHE03

Comet P/1994 P1 (Machholz 2) [= 1994o] component A (cont.)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 09 11.11	B	8.2	S	6.0	B		20	& 7	4/	&0.2	330	SCI
1994 09 11.11	B	8.3	AA	15.6	L	10	54	7	5			KOS
1994 09 11.12	S	7.9	SC	20.0	L	4	42	5	5			SCH04
1994 09 11.35	S	7.5	SC	20	L	8	46	4	7	0.01	85	DID
1994 09 11.38	S	7.5	HR	5.0	B		10	8	6			BOR
1994 09 11.40				35.9	L	7	85	2.2	3	0.07	297	MOD
1994 09 11.40	M	8.4	GA	5.0	B		10	7	2/			MOD
1994 09 12.1	M	8.0	AA	6.0	B		20	10	5			CSU
1994 09 12.31	S	7.7	SC	20	L	8	46	6	7	0.01	265	DID
1994 09 12.38				31.7	L	6	68	3.5	6	?	310	BOR
1994 09 12.38	S	7.7	HR	5.0	B		10	5	6			BOR
1994 09 12.40	M	8.6	GA	5.0	B		10					MOD
1994 09 12.40	S	8.4	GA	5.0	B		10	6.5	2			MOD
1994 09 12.41				35.9	L	7	85	2.2	3	0.06	291	MOD
1994 09 13.10	S	7.8	SC	20.0	L	4	42	5	6			SCH04
1994 09 13.10	S	8.2	S	6.7	B		20	& 8	3/			SCI
1994 09 14.11	S	8.5	AA	15.6	L	10	54	7	3			KOS
1994 09 15.30	S	8.0	SC	20	L	8	46	5	6			DID
1994 09 16.11	S	9.3	S	6.7	B		20	& 7	3/			SCI
1994 09 16.34	S	7.9	SC	20	L	8	46	3				DID
1994 09 17.11	S	9.2	S	6.7	B		20	& 7	3/			SCI
1994 09 18.11	M	8.5	TI	13	L	8	69	4	3/			HOR02
1994 09 18.12	S	9.3:	S	6.7	B		20	& 7	3/			SCI
1994 09 18.42	M	9.7	GA	20.0	L	5	35					MOD
1994 09 18.42	S	9.6	GA	20.0	L	5	35	2.5	2/			MOD
1994 09 25.10	S	8.8	S	12.0	R	5	25	2.5	4			CHE03
1994 09 30.41	S	9.7	HS	33.3	L	4	56	3.4	3			KR002
1994 10 03.36	S	9.8	GA	20	L	8	46	4	0/			DID
1994 10 04.15	S	9.2	VB	33.3	L	5	85	2.3	2			SHA02
1994 10 04.38	S	9.5	GA	20	L	8	46	4	1			DID
1994 10 05.11	S	9.1	TI	11	L	8	54	3.5	0			KYS
1994 10 05.14	* C	10.5	L	65	L	4		+ 2.0		>0.11	296	PRA01
1994 10 05.14	* C	11.1	L	65	L	4		+ 1.3		>0.11	296	PRA01
1994 10 05.14	M	9.1	TI	13	L	8	69	3.5	3/			HOR02
1994 10 05.14	* c	14.3	L	65	L	4		6		>0.11	296	PRA01
1994 10 05.45	S	9.8	HS	33.3	L	4	56	3.5	2			KR002
1994 10 06.12	S	10.0	TI	11	L	8	54	3	0			KYS
1994 10 06.16	S	9.9:	CS	20.3	T	10	80	1.0	2			GAR02
1994 10 07.14	S	10.3	TI	11	L	8	54	2.5	3			KYS
1994 10 07.36	S	10.0	GA	20	L	8	46	5	0/			DID
1994 10 07.42	S	11.0	GA	20.0	L	5	68	2.0	1			MOD
1994 10 08.15	S	9.3	AC	20.0	L	4	42	3	0/			SCH04
1994 10 10.19	S	9.4	VB	33.3	L	5	85	1.6	2			SHA02
1994 10 11.42	S	11.4	GA	35.9	L	7	85	1.8	1			MOD
1994 10 12.42	S	11.5	GA	35.9	L	7	85	1.8	1			MOD
1994 10 12.43	S	11.1	GA	20.0	L	5	35	2.2	1			MOD
1994 10 15.16	S	10.5	HS	20.3	T	10	51	1.5	2			HAS02
1994 10 15.42	S	11.5	GA	35.9	L	7	85	2.0	1			MOD
1994 10 31.82	a C	13.4	GA	60.0	Y	6		2.7			295	NAK01
1994 11 02.18	! C	14.6	L	65	L	4		+ 1.0		>0.12	291	PRA01
1994 11 02.18	! c	18.1	L	65	L	4		1.8		>0.12	291	PRA01
1994 11 11.45	S[	12.0	GA	35.9	L	7	85	! 1.5				MOD
1994 12 06.82	C	15.7	GA	60.0	Y	6		2.0	0		288	NAK01
1994 12 07.18	S[	13.0	AC	20.3	T	10	80	! 0.5				GAR02

Comet P/1994 P1 (Machholz 2) [= 1994o] component B

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 11 02.18	! C	17.3	L	65	L	4		0.4				PRA01

Comet P/1994 P1 (Machholz 2) [= 1994o] component D

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 08 30.10	V	12.1	HS	65	L	4		> 2.0				PRA01
1994 08 30.10	V	12.7	HS	65	L	4		> 1.3				PRA01
1994 08 30.10	v	16.3	HS	65	L	4		2.2				PRA01
1994 09 04.10	S	10.5	HS	20.3	T	10	51	2.2	1			HAS02
1994 09 08.40	S	12.2	GA	35.9	L	7	85	1.6	0			MOD
1994 09 11.40	S	12.2:	GA	35.9	L	7	85	2.2	0			MOD
1994 09 30.41	S	10.1	HS	33.3	L	4	56	2.4	3			KR002
1994 10 03.42	S	12.2	GA	35.9	L	7	85	1.1	1			MOD
1994 10 04.15	S	10.4	HS	33.3	L	5	85	1.7	1			SHA02
1994 10 05.11	S	10.0	TI	11	L	8	54	2.5	2			KYS
1994 10 05.14 *	C	11.2	L	65	L	4		+ 2.0		>0.09	291	PRA01
1994 10 05.14 *	C	11.7	L	65	L	4		+ 1.3		>0.09	291	PRA01
1994 10 05.14	M	12.6	HS	13	L	8	69	1.5	2			HOR02
1994 10 05.14 *	c	16.5:	L	65	L	4		6		>0.09	291	PRA01
1994 10 05.44	S	11.4	HS	33.3	L	4	56	1.3	1			KR002
1994 10 06.12	O[	10.4	TI	11	L	8	54	& 2.5				KYS
1994 10 07.14	O[	10.6	TI	11	L	8	54	& 2.5				KYS
1994 10 07.42	S	11.6	GA	20.0	L	5	68	2.0	0			MOD
1994 10 10.19	S	9.7	VB	33.3	L	5	85	1.1	2			SHA02
1994 10 11.42	S	12.1	GA	35.9	L	7	85	1.4	0			MOD
1994 10 12.42	S	12.3	GA	35.9	L	7	85	1.4	0			MOD
1994 10 15.43	S	12.3	GA	35.9	L	7	85	1.6	0			MOD
1994 10 31.82 a	C	15.5	GA	60.0	Y	6		1.1				NAK01
1994 11 02.18 !	C	15.4	L	65	L	4		+ 1.0		>0.09	290	PRA01
1994 11 11.45	S[	11.8	GA	35.9	L	7	85	! 1.5				MOD

Comet 4P (Faye) [= 1991 XXI]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1991 09 06.97	S	10.5	AA	10.0	B		20	2.6				KEI
1991 09 08.11	S	10.7	PB	10.0	B		20	2.4	6			KEI
1991 10 05.98	S	9.7	AA	10.0	B		20	1.6	4/			KEI
1991 10 06.83	O	9.8	NP	11	L	8	54	3	3			KYS
1991 10 07.79	O	10.0	NP	11	L	8	32					KYS
1991 10 09.84	O	9.7	NP	10	B		25	3				KYS
1991 10 16.98	O	9.6	NP	11	L	8	32	3	2			KYS
1991 10 27.76	O	9.3	NP	11	L	8	54	4				KYS
1991 10 28.76	O	9.7	NP	11	L	8	32					KYS
1991 10 31.77	O	9.3	NP	11	L	8	54	4				KYS
1991 11 01.79	O	10.0	NP	11	L	8	54	2	5			KYS
1991 11 03.86	O	9.7	NP	11	L	8	32	2	3			KYS
1991 11 05.75	O	9.4	NP	11	L	8	32	3				KYS
1991 11 06.79	O	9.7	NP	11	L	8	32	3				KYS
1991 11 09.94	S	9.4	AA	10.0	B		20	2.9	5/			KEI
1991 11 10.76	O	10.2	NP	11	L	8	54	2				KYS
1991 11 17.08	S	9.5	AA	10.0	B		20	3.9	5			KEI
1991 12 06.81	S	9.8	AA	10.0	B		20	2.1	2/			KEI
1991 12 07.85	S	9.7	AA	10.0	B		20	2.6	2			KEI

Comet 16P (Brooks 2) [= 1994j]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 07 12.36	S[	14.0	GA	35.9	L	7	164	! 0.5				MOD
1994 08 07.38	S[	14.0	GA	35.9	L	7	164	! 0.5				MOD
1994 08 08.37	S[	14.1	GA	35.9	L	7	164	! 0.5				MOD
1994 08 16.36	S[	14.4	GA	35.9	L	7	164	! 0.5				MOD
1994 09 04.37	S[	14.5	GA	35.9	L	7	164	! 0.5				MOD
1994 09 08.36	S[	14.5	GA	35.9	L	7	164	! 0.5				MOD
1994 09 12.32	S[	14.5	GA	35.9	L	7	164	! 0.5				MOD
1994 10 03.35	S[	14.6	GA	45.7	L	4	135	! 0.5				MOD
1994 10 05.15	S	12.3:	TI	11	L	8	54	0.8				KYS
1994 10 06.05	S[	13.5	AC	20.3	T	10	167	! 0.5				GAR02
1994 10 06.11	S	12.3	TI	11	L	8	54	0.7	3			KYS

Comet 16P (Brooks 2) [= 1994j] (cont.)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 10 07.11		0[12.1	TI	11	L	8	54	& 0.8				KYS
1994 10 07.25		S[14.5	GA	35.9	L	7	164	! 0.5				MOD
1994 10 09.90		S[14.0	HS	44.5	L	5	226					HAS02
1994 10 11.36		S[14.5	GA	35.9	L	7	164	! 0.5				MOD
1994 10 12.34		S[14.5	GA	35.9	L	7	164	! 0.5				MOD
1994 10 30.55		C 14.7	GA	60.0	Y	6		1.0		0.04	252	NAK01
1994 10 31.87		0[14.4	HS	35	L	5	92	& 1				HOR02
1994 11 01.85		0[13.9	HS	35	L	5	92	& 1				HOR02
1994 11 02.93		C 14.7	HS	65	L	4		0.9		>0.09	265	PRA01
1994 11 02.93		c 16.5	HS	65	L	4		0.9		>0.09	265	PRA01
1994 11 04.59		C 14.6	HS	20.0	L	6		0.8				IT002
1994 11 05.89		M 12.9	NP	30	L	5	60					POP
1994 11 08.24		S[14.4	GA	35.9	L	7	164	! 0.5				MOD
1994 11 08.67		C 14.5	GA	60.0	Y	6		1.5		0.05	270	NAK01
1994 11 12.32		S[14.2	GA	35.9	L	7	164	! 0.5				MOD
1994 11 24.53		C 15.0	GA	60.0	Y	6		1.1				NAK01
1994 11 25.90	!	V 15.8	YF	20.0	T	2		& 1	5			MIK
1994 12 02.79		S[14.5	HS	44.5	L	5	156					HAS02
1994 12 03.14		S[14.5	GA	35.9	L	7	164	! 0.5				MOD
1994 12 03.80	!	V 15.0	YF	20.0	T	2		2.5	3			MIK

Comet 97P/1991 A1 (Metcalf-Brewington) [= 1991 I]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1991 01 15.78		S 8.6	AA	10.0	B		20	2.0	2			KEI
1991 01 16.80		S 8.6	AA	10.0	B		20	1.8	2/			KEI
1991 01 17.77		S 8.7	AA	10.0	B		20	3.5	4	0.20	68	KEI

Comet 30P (Reinmuth 1) [= 1994p]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 09 01.70		C 19.9	HS	60.0	Y	6						NAK01
1994 09 03.73		C 20.1:	GA	60.0	Y	6						NAK01
1994 10 14.75		C 18.7	GA	60.0	Y	6		0.25			245	NAK01
1994 10 30.56		C 18.7	GA	60.0	Y	6		0.25				NAK01
1994 11 08.66		C 18.4	GA	60.0	Y	6		0.25				NAK01
1994 11 24.51		C 18.4	GA	60.0	Y	6		0.25				NAK01
1994 12 06.43		C 18.5	GA	60.0	Y	6		0.3				NAK01

Comet 36P (Whipple) [= 1993n]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 07 07.73		C 19.7	GA	60.0	Y	6		0.18				NAK01
1994 08 03.69		C 19.3	GA	60.0	Y	6		0.2				NAK01
1994 08 17.77		C 18.9	GA	60.0	Y	6		0.2			240	NAK01
1994 09 08.71		C 17.9	GA	60.0	Y	6		0.2				NAK01
1994 10 02.55		C 17.7	GA	60.0	Y	6		0.25		0.02	243	NAK01
1994 10 25.54		C 17.8	GA	60.0	Y	6		0.25				NAK01
1994 11 06.52		C 17.9	GA	60.0	Y	6		0.3				NAK01
1994 11 23.44		C 18.2	GA	60.0	Y	6		0.25				NAK01
1994 12 04.43		C 18.4	GA	60.0	Y	6		0.25			330	NAK01

Comet 47P (Ashbrook-Jackson) [= 1992j]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 10 14.80		C 19.9	GA	60.0	Y	6		0.2				NAK01
1994 11 08.77		C 19.6	GA	60.0	Y	6		0.2				NAK01
1994 12 05.75		C 19.4	GA	60.0	Y	6		0.2			295	NAK01

Comet 24P (Schaumasse) [= 1992x]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 01 01.55		S 11.8	AC	13	L	6	62	2	3			ISH02

Comet 24P (Schaumasse) [= 1992x] (cont.)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1993 01 05.39	S	11.5	AC	13	L	6	88	1.5	2			ISH02
1993 01 08.45	S	11.3	AC	13	L	6	88	2	3			ISH02
1993 01 12.49	S	10.8	AC	13	L	6	44	3	3			ISH02
1993 01 17.41	S	10.2	AC	13	L	6	44	3	3			ISH02
1993 01 17.56	S	10.0	AC	10.0	B		20	3	3			ISH02
1993 01 19.41	S	9.9	AA	13	L	6	44	3.5	3			ISH02
1993 01 19.43	S	9.8	AC	10.0	B		20	4	2			ISH02
1993 01 20.56	S	9.8	AA	10.0	B		20	4	3			ISH02
1993 01 20.56	S	9.8	AC	13	L	6	44	4	3			ISH02
1993 01 21.49	S	10.3	AC	13	L	6	62	3	3			ISH02
1993 01 22.47	S	11.2	HS	40	L	5	56	3	3			KON03
1993 01 22.55	S	10.8	A	20	L	6	48	2	2			YAS
1993 01 22.56	S	10.1	AC	13	L	6	62	3	3			ISH02
1993 01 28.43	S	9.5	AC	13	L	6	44	3	3			ISH02
1993 02 10.46	S	9.3	AC	13	L	6	44	4	3			ISH02
1993 02 11.50	S	9.5	AA	12.0	B		20	4	2			MIT
1993 02 13.48	S	9.0	S	15	L	9	33					IWA01
1993 02 14.44	S	9.0	S	15	L	9	52					IWA01
1993 02 14.50	S	9.3	AA	12.0	B		20	6	2			MIT
1993 02 17.46	S	9.2	AC	13	L	6	62	3.0	2			ISH02
1993 02 19.43	S	9.1	AC	13	L	6	44	3.8	3			ISH02
1993 02 19.45	S	9.3	AC	10.0	B		20	4.0	3			ISH02
1993 02 19.46	B	9.2	AA	12.0	B		20	6	3			HAS07
1993 02 19.53	M	8.3	S	16.0	W	4	19	5	3			TSU02
1993 02 20.45	S	9.1		40	L	5	60	6	5			KON03
1993 02 20.49	S	9.4	AA	12.0	B		20	8	2			MIT
1993 02 22.41	S	9.0	AC	13	L	6	44	4.0	3			ISH02
1993 02 23.51	S	9.1	AC	13	L	6	44	4.1	3			ISH02
1993 02 23.52	S	9.0	AC	10.0	B		20	4.6	3			ISH02
1993 02 25.48	M	9.5	AA	12.0	B		20	7	2			MIT
1993 02 25.52	S	8.9	AC	13	L	6	24	4.7	3			ISH02
1993 02 25.55	S	8.9	AC	10.0	B		20	4.6	3			ISH02
1993 02 28.50	S	8.8	AC	13	L	6	24	4.7	3			ISH02
1993 02 28.52	S	8.9	AC	10.0	B		20	4.8	3			ISH02
1993 03 01.53	S	8.8	AC	13	L	6	24	4.0	3			ISH02
1993 03 02.69	S	9.0	AC	13	L	6	44	3.0	2			ISH02
1993 03 10.46	M	9.0	S	20	L	5	34	4	4			TSU02
1993 03 11.46	S	9.8	HS	40	L	5	60	8	6			KON03
1993 03 13.50	M	8.9	AA	12.0	B		20	10	3			MIT
1993 03 13.50	M	9.1	S	20	L	5	34	3.5	4			TSU02
1993 03 13.60	S	9.3	AC	10.0	B		20	4.0	2			ISH02
1993 03 14.59	S	9.2	AC	13	L	6	24	4.0	3			ISH02
1993 03 17.50	M	8.9	AA	12.0	B		20	8	3			MIT
1993 03 17.59	P	8.5	S	14.3	R	3		3	5			KAN04
1993 03 17.59	S	8.5	S	12.5	B		25	2	4			KAN04
1993 03 21.46	S	10.4	A	20	L	6	48	2.5	3			YAS
1993 03 24.91	B	8.9	S	11.0	B		20	3	3			CHE03
1993 04 14.50	M	8.6	S	16.0	W	4	19	8	1			TSU02
1993 04 18.53	M	8.9	S	16.0	W	4	49	4.5	2			TSU02
1993 05 16.52	S	10.8	HS	40	L	5	60	4	4			KON03

Comet 115P/1994 J1 (Maury) [= 1994h]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 10 02.54	C	17.7	GA	60.0	Y	6		0.3				NAK01
1994 10 25.46	C	18.2	GA	60.0	Y	6		0.3				NAK01
1994 11 23.45	C	19.4	GA	60.0	Y	6		0.25				NAK01

Comet 1P/1982 U1 (Halley) [= 1986 III]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1986 02 21.27	[	2.5:		8.0	B		20					KEI
1986 03 02.27	M	3.2	AA	5.0	B		10	3.3	9	2.5	270	KEI

Comet 1P/1982 U1 (Halley) [= 1986 III] (cont.)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1986 03 03.28	I	3.1	AA	0.0	E		1			3.0	270	KEI
1986 03 03.28	M	3.2	AA	2.5	B		2					KEI
1986 03 03.28	M	3.3	AA	5.0	B		10	2.6	9	2.25	270	KEI
1986 03 04.26	I	3.2	AA	0.0	E		1			9	270	KEI
1986 03 04.26	M	3.2	AA	2.5	B		2					KEI
1986 03 04.26	M	3.2	AA	5.0	B		10	2.6	8/	2.75	275	KEI
1986 03 05.25	I	3.2	AA	0.0	E		1	10		9	270	KEI
1986 03 05.25	M	3.2	AA	5.0	B		10	2.1	9	1.75	270	KEI
1986 03 06.26	I	3.2	AA	0.0	E		1	10		4.0	266	KEI
1986 03 06.26	M	3.2	AA	2.5	B		2			3.5	266	KEI
1986 03 06.26	M	3.3	AA	5.0	B		10	2.6	8/	2.75	266	KEI
1986 03 08.26	I	3.1	AA	0.0	E		1			6.75	267	KEI
1986 03 08.26	M	3.1	AA	2.5	B		2			4.25	267	KEI
1986 03 08.26	M	3.1	AA	5.0	B		10	8	8/	3.0	258	KEI
1986 03 09.25	I	3.0	AA	0.0	E		1			10	270	KEI
1986 03 09.25	M	3.1	AA	2.5	B		2					KEI
1986 03 09.25	M	3.2	AA	5.0	B		10	1.7	9	7	262	KEI
1986 03 10.24	I	3.1	AA	0.0	E		1			18	270	KEI
1986 03 10.24	M	3.1	AA	2.5	B		2					KEI
1986 03 10.24	M	3.2	AA	5.0	B		10	3.4	9	6.5	260	KEI
1986 03 11.24	I	2.9	AA	0.0	E		1	15	7/	8	277	KEI
1986 03 11.24	M	3.1	AA	2.5	B		2					KEI
1986 03 11.24	M	3.1	AA	5.0	B		10		9	4.5	268	KEI
1986 03 12.24	I	3.0	AA	0.0	E		1	12	7	9.75	270	KEI
1986 03 12.24	M	3.2	AA	2.5	B		2			4.5	265	KEI
1986 03 12.24	M	3.2	AA	5.0	B		10	1.0	9	4.25	264	KEI
1986 03 13.24	I	2.9	AA	0.0	E		1	12	7	12	272	KEI
1986 03 13.24	M	3.1	AA	5.0	B		10	1.0	9	4.25	264	KEI
1986 03 13.24	M	3.3	AA	2.5	B		2					KEI
1986 03 14.24	I	3.0	AA	0.0	E		1			7	274	KEI
1986 03 14.24	M	3.2	AA	5.0	B		10	1.7	9	5.75	266	KEI
1986 04 03.17	I	2.9	AA	0.0	E		1	23		4.70	294	KEI
1986 04 03.17	M	2.9	AA	2.5	B		2					KEI
1986 04 03.17	M	3.0	AA	5.0	B		10	25	7/	3.0	294	KEI
1986 04 04.14	M	2.9	AA	5.0	B		10	24	7/	2.66	287	KEI
1986 04 04.14	M	3.1	AA	2.5	B		2					KEI
1986 04 05.15	I	2.9	AA	0.0	E		1	32				KEI
1986 04 05.15	M	2.9	AA	5.0	B		10	23	7	3.0	310	KEI
1986 04 06.10	G	2.5	AA	0.0	E		1					KEI
1986 04 06.10	I	2.7	AA	0.0	E		1	32		9	300	KEI
1986 04 06.10	M	2.8	AA	2.5	B		2	14		6	300	KEI
1986 04 06.10	M	2.8	AA	5.0	B		10	15.0	7/	4.66	290	KEI
1986 04 07.14	G	2.4	AA	0.0	E		1					KEI
1986 04 07.14	I	2.2	AA	0.0	E		1	32		10.25	320	KEI
1986 04 07.14	M	2.7	AA	2.5	B		2	15				KEI
1986 04 07.14	M	2.8	AA	5.0	B		10	19	7	3.0	300	KEI
1986 04 08.08	G	2.3	AA	0.0	E		1					KEI
1986 04 08.08	I	2.1	AA	0.0	E		1	29		3.0	319	KEI
1986 04 08.08	M	2.5	AA	2.5	B		2					KEI
1986 04 08.08	M	2.8	AA	5.0	B		10	25	7/	3.0	302	KEI
1986 04 09.14	I	2.1	AA	0.0	E		1	27		3.66	317	KEI
1986 04 09.14	M	2.8	AA	2.5	B		2	12				KEI
1986 04 09.14	M	2.8	AA	5.0	B		10	22	7/	4.0	317	KEI
1986 04 10.11	I	2.0	AA	0.0	E		1	29		3.33	330	KEI
1986 04 10.11	M	2.7	AA	2.5	B		2	23				KEI
1986 04 10.11	M	2.8	AA	5.0	B		10	29	7/	1.66	315	KEI
1986 04 11.04	G	2.7	AA	0.0	E		1					KEI
1986 04 11.04	I	2.3	AA	0.0	E		1	27				KEI
1986 04 11.04	M	3.1	AA	2.5	B		2	15		5.0	330	KEI
1986 04 11.04	M	3.1	AA	5.0	B		10	24	7	4.13	328	KEI
1986 04 12.01	I	2.5	AA	0.0	E		1	21				KEI
1986 04 12.01	M	3.2	AA	2.5	B		2	10				KEI
1986 04 12.01	M	3.4	AA	5.0	B		10	20	7	1.33	5	KEI

Comet 1P/1982 U1 (Halley) [= 1986 III] (cont.)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1986 04 13.00	I	2.6	AA	0.0	E		1	24		3.30	20	KEI
1986 04 13.00	M	3.2	AA	2.5	B		2	10		2.70	18	KEI
1986 04 13.00	M	3.5	AA	5.0	B		10	18	7	1.46	347	KEI
1986 04 14.03	M	3.5	AA	5.0	B		10	20	7	0.87	19	KEI
1986 04 14.17	I	2.5	AA	0.0	E		1	36				KEI
1986 04 14.17	M	3.4	AA	2.5	B		2	12.5		2.70	18	KEI
1986 04 15.01	G	2.8	AA	0.0	E		1					KEI
1986 04 15.01	I	2.4	AA	0.0	E		1	42		4.0	25	KEI
1986 04 15.01	M	3.2	AA	2.5	B		2	16				KEI
1986 04 15.01	M	3.4	AA	5.0	B		10	32	7	2.33	20	KEI
1986 04 16.05	I	2.6	AA	0.0	E		1	39		5.33	29	KEI
1986 04 16.05	M	3.3	AA	2.5	B		2					KEI
1986 04 16.05	M	3.6	AA	5.0	B		10	28	8	2.5	29	KEI
1986 04 18.96	M	3.5	AA	5.0	B		10	15.0				KEI
1986 04 19.93	I	3.2	AA	0.0	E		1					KEI
1986 04 19.93	M	4.1	AA	5.0	B		10		7			KEI
1986 04 20.98	I	3.3	AA	0.0	E		1					KEI
1986 04 20.98	M	4.2	Y	5.0	B		10	10.0		0.75	30	KEI
1986 04 27.90	M	4.3	AA	2.5	B		2					KEI
1986 04 27.90	M	4.5	AA	5.0	B		10	9.3	6/	0.75	86	KEI
1986 04 28.92	M	4.2	AA	2.5	B		2					KEI
1986 04 28.92	M	4.5	AA	5.0	B		10	15	6	1.5	111	KEI
1986 05 01.92	M	4.9	AA	5.0	B		10					KEI
1986 05 01.92	M	5.0	AA	8.0	B		20	5.3	6			KEI
1986 05 03.89	M	5.2	AA	5.0	B		10	11.0	5			KEI
1986 05 12.92	M	6.2	AA	5.0	B		10		5			KEI
1986 05 13.90	M	6.2	AA	5.0	B		10	7.4	4			KEI
1986 05 15.90	M	6.3	AA	5.0	B		10	4.2	4			KEI
1986 05 26.93	M	6.3	AA	8.0	B		20	4.9	3/			KEI
1986 05 28.93	M	6.3	AA	5.0	B		10	3.9				KEI
1986 05 28.93	M	6.5	AA	8.0	B		20	5.9	2			KEI
1987 01 03.19	S	12.5	AC	29.8	L	5	89	0.9	2		335	KEI
1987 01 06.20	S	12.5	AC	29.8	L	5	62	0.6	1/			KEI

Comet 109P/1992 S2 (Swift-Tuttle) [= 1992 XXVIII]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1992 10 02.90	S	8.3	AA	10.0	B		20	5.9	4			KEI
1992 10 04.84	S	8.3	AA	10.0	B		20	5.4	4			KEI
1992 10 05.17	S	8.2	AA	5.0	B		10	8.6	4			KEI
1992 10 10.21	S	8.0	AA	5.0	B		10	4.4	4/			KEI
1992 10 17.79	S	7.2	AA	8.0	B		10	7.4	4			KEI
1992 10 18.93	S	7.3	AA	5.0	B		10	7.2	5			KEI
1992 10 22.82	B	6.7	A	5.0	B		10			0.5		DIM
1992 10 23.80	S	6.5	AA	3.2	B		6					KEI
1992 10 23.80	S	6.6	AA	5.0	B		10	11.7	6			KEI
1992 10 25.86	S	6.5	AA	5.0	B		10	10	5			KEI
1992 10 26.80	B	6.7	A	5.0	B		10					DIM
1992 10 27.80	B	6.8	A	5.0	B		10					DIM
1992 10 29.80	B	6.8	A	5.0	B		10					DIM
1992 10 30.83	S	6.0	SP	5.0	B		10	7.2	6/	0.40	34	KEI
1992 10 31.78	S	6.0	SP	3.2	B		6	13.5				KEI
1992 10 31.78	S	6.0	SP	5.0	B		10	6.4	6	0.33	39	KEI
1992 11 06.78	B	6.0	A	5.0	B		10					DIM
1992 11 06.81	S	5.9	AA	5.0	B		10	4.0	7	0.57	40	KEI
1992 11 07.78	B	6.0	A	5.0	B		10					DIM
1992 11 13.76	B	6.1	A	5.0	B		10					DIM
1992 11 14.76	B	5.8	A	5.0	B		10					DIM
1992 11 15.89	M	5.4	NP	5.0	B		16	10				POP
1992 11 18.75	B	5.6	SC	5.0	B		10			1.5		DIM
1992 11 20.74	B	5.4	SC	5.0	B		10			2		DIM
1992 11 23.75	B	5.2	SC	5.0	B		10			2		DIM
1992 11 24.76	B	5.2	SC	5.0	B		10			2		DIM

Comet 109P/1992 S2 (Swift-Tuttle) [= 1992 XXVIII] (cont.)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1992 11 26.77	M	5.2	AA	3.2	B		6					KEI
1992 11 26.77	M	5.2	AA	5.0	B		10	3.7	8	1.83	42	KEI
1992 11 27.74	B	5.0	SC	5.0	B		10			1.5		DIM
1992 11 27.77	B	5.1	AA	2.5	B		2					KEI
1992 11 27.77	I	4.9	AA	0.0	E		1					KEI
1992 11 27.77	M	5.2	AA	5.0	B		10	3.5	8	1.5	47	KEI
1992 11 30.74	B	5.1	AA	2.5	B		2					KEI
1992 11 30.74	M	5.1	AA	3.2	B		6	3.6	7/			KEI
1992 11 30.74	M	5.1	AA	5.0	B		10	2.4	7/	1.0	39	KEI
1992 11 30.75	B	5.2	SC	5.0	B		10			1		DIM
1992 12 05.73	M	5.2	AA	5.0	B		10	2.4	8	0.67	46	KEI
1992 12 06.74	B	5.4	SC	5.0	B		10			1		DIM
1992 12 12.74	M	5.3	SP	5.0	B		10	2.5	7/	0.67	45	KEI
1992 12 15.72	B	5.8	A	5.0	B		10			1		DIM
1993 03 19.87	M	9.6	S	20	L	5	50	6	2			TSU02

Comet 23P/1989 N1 (Brorsen-Metcalf) [= 1989 X]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1989 08 04.05	B	6.8	A	25	T	10	125	5	3	0.03	270	DIM
1989 08 10.05	B	6.2	A	50	L	5	156	5	5	0.03	290	DIM
1989 08 30.10	B	5.2	SC	50	L	5	139	8	5	1	310	DIM
1989 09 01.10	B	5.5	SC	50	L	5	62	8	5	2	303	DIM

Comet 29P (Schwassmann-Wachmann 1) [= 1989 XV]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 09 18.41	S	[13.2	AC	35.9	L	7	164	! 0.5				MOD
1994 10 11.44	S	[12.2	GA	35.9	L	7	164	! 0.5				MOD
1994 10 12.41	S	[14.2	GA	35.9	L	7	164	! 0.5				MOD
1994 10 15.43	S	[13.8	GA	35.9	L	7	164	! 0.5				MOD
1994 10 31.80	C	13.8	GA	60.0	Y	6		2.1	3			NAK01
1994 11 03.77	C	13.8	GA	60.0	Y	6		2.6	2			NAK01
1994 11 06.17	C	14.2	HS	65	L	4		0.8				PRA01
1994 11 06.17	c	16.2	HS	65	L	4		0.8				PRA01
1994 11 07.83	C	13.7	GA	60.0	Y	6		2.3	3			NAK01
1994 11 08.79	C	14.0	GA	60.0	Y	6		1.5	3			NAK01
1994 11 11.44	S	[14.2	GA	35.9	L	7	164	! 0.5				MOD
1994 11 12.38	S	14.3	GA	35.9	L	7	164	0.55	1/			MOD
1994 12 03.13	S	[13.5	AC	44.5	L	5	230					SAR02
1994 12 03.33	S	[14.3	GA	35.9	L	7	164	! 0.5				MOD
1994 12 04.16	! V	14.9	YF	20.0	T	2		& 2	3			MIK
1994 12 05.78	C	13.7	GA	60.0	Y	6		2.6				NAK01
1994 12 05.78	c	16.4	GA	60.0	Y	6						NAK01
1994 12 07.08	S	[13.2	AC	20.3	T	10	167	! 0.5				GAR02
1994 12 09.70	C	13.8	GA	60.0	Y	6		2.2				NAK01
1994 12 09.70	c	16.2	GA	60.0	Y	6						NAK01

Comet P/1991 L3 (Levy) [= 1991 XI]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1991 08 04.12	S	8.8	AA	10.0	B		20	2.5	3/			KEI
1991 08 08.05	0	10.0:	NP	11	L	8	54	3				KYS
1991 08 10.12	S	9.3	AA	10.0	B		20	3.1	3			KEI
1991 08 15.13	S	9.3	AA	10.0	B		20	2.9	2			KEI
1991 08 19.12	S	9.6	AA	10.0	B		20	4.5	2			KEI
1991 08 21.12	S	9.7	AA	10.0	B		20	2.2	2			KEI
1991 09 08.15	S	9.8	AA	10.0	B		20	2.5	2/			KEI
1991 11 17.10	S	[10.5	AA	10.0	B		20					KEI

Comet P/1993 K2 (Helin-Lawrence) [= 1993l]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 09 06.25		c 19.3	FA	91.4	L	5						SCO01
1994 09 06.28		C 16.5	FA	91.4	L	5		0.40		0.10	289	SCO01
1994 10 24.45		C 17.2	GA	60.0	Y	6		0.35				NAK01
1994 10 25.51	a	C 17.3	GA	60.0	Y	6		0.35				NAK01
1994 11 06.42		C 17.1	GA	60.0	Y	6		0.65			260	NAK01
1994 11 23.41	a	C 17.5	GA	60.0	Y	6		0.4				NAK01
1994 12 04.42		C 17.3	GA	60.0	Y	6		0.4			250	NAK01

Comet P/1994 N2 (McNaught-Hartley) [= 1994n]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 07 15.73	a	C 16.4	GA	60.0	Y	6		0.3			300	NAK01
1994 09 25.48	a	C 15.7	GA	60.0	Y	6		0.55			45	NAK01
1994 10 24.42	a	C 16.0	GA	60.0	Y	6		0.35				NAK01
1994 11 06.41	a	C 15.7	GA	60.0	Y	6		0.75		0.04	70	NAK01
1994 11 23.40	a	C 16.0	GA	60.0	Y	6		0.7		0.03	83	NAK01

Comet P/1994 X1 (McNaught-Russell) [= 1994u]

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 12 15.01		C 16.3	HS	65	L	4		0.4		0.01	340	PRA01
1994 12 15.01		c 17.2	HS	65	L	4		0.4		0.01	340	PRA01

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NUMBERINGS OF PERIODIC COMETS

The following list of numberings of periodic comets has been produced in accordance with the IAU Commission 20 resolution printed on *MPC* 23803–23804. The 115 comets involved are generally those that have been observed to return, 111P/Helin-Roman-Crockett being added because it has been followed through aphelion. The cases 95P/Chiron and 107P/Wilson-Harrington are intended as *alternative appellations* for (2060) Chiron and (4015) Wilson-Harrington, the two objects with permanent minor-planet numbers that have been observed to exhibit cometary activity. The particular sequence of numbers used has been designed to follow the historical order in which the comets were fully demonstrated to be periodic (e.g., by virtue of their returning). Also in accord with the IAU resolution, in some cases the usual "P/" has been replaced by "D/" to indicate that these comets are "lost" (i.e., it is not possible to predict their returns). Placement in this category is somewhat subjective, but in this first attempt the "D/" notation has been applied to the five cases 3D/Biela, 5D/Brorsen, 11D/Tempel-Swift, 20D/Westphal and 25D/Neujmin 2. [taken from *MPC* 24252]

1P/Halley
2P/Encke
3D/Biela
4P/Faye
5D/Brorsen
6P/d'Arrest
7P/Pons-Winnecke
8P/Tuttle
9P/Tempel 1
10P/Tempel 2
11D/Tempel-Swift
12P/Pons-Brooks
13P/Olbers
14P/Wolf
15P/Finlay
16P/Brooks 2
17P/Holmes
18P/Perrine-Mrkos
19P/Borrelly
20D/Westphal
21P/Giacobini-Zinner
22P/Kopff
23P/Brorsen-Metcalf
24P/Schaumasse
25D/Neujmin 2
26P/Grigg-Skjellerup
27P/Crommelin
28P/Neujmin 1
29P/Schwassmann-Wachmann 1
30P/Reinmuth 1
31P/Schwassmann-Wachmann 2
32P/Comas Solá
33P/Daniel
34P/Gale
35P/Herschel-Rigollet
36P/Whipple
37P/Forbes
38P/Stephan-Oterma
39P/Oterma
40P/Väisälä 1
41P/Tuttle-Giacobini-Kresák
42P/Neujmin 3
43P/Wolf-Harrington
44P/Reinmuth 2
45P/Honda-Mrkos-Pajdušáková
46P/Wirtanen
47P/Ashbrook-Jackson
48P/Johnson
49P/Arend-Rigaux
50P/Arend
51P/Harrington
52P/Harrington-Abell
53P/Van Biesbroeck
54P/de Vico-Swift
55P/Tempel-Tuttle
56P/Slaughter-Burnham
57P/du Toit-Neujmin-Delporte
58P/Jackson-Neujmin
59P/Kearns-Kwee
60P/Tsuchinshan 2
61P/Shajn-Schaldach
62P/Tsuchinshan 1
63P/Wild 1
64P/Swift-Gehrels
65P/Gunn
66P/du Toit
67P/Churyumov-Gerasimenko
68P/Klemola
69P/Taylor
70P/Kojima
71P/Clark
72P/Denning-Fujikawa
73P/Schwassmann-Wachmann 3
74P/Smirnova-Chernykh
75P/Kohoutek

76P/West-Kohoutek-Ikemura
77P/Longmore
78P/Gehrels 2
79P/du Toit-Hartley
80P/Peters-Hartley
81P/Wild 2
82P/Gehrels 3
83P/Russell 1
84P/Giclas
85P/Boethin
86P/Wild 3
87P/Bus
88P/Howell
89P/Russell 2
90P/Gehrels 1
91P/Russell 3
92P/Sanguin
93P/Lovas 1
94P/Russell 4
95P/Chiron
96P/Machholz 1
97P/Metcalf-Brewington
98P/Takamizawa
99P/Kowal 1
100P/Hartley 1
101P/Chernykh
102P/Shoemaker 1
103P/Hartley 2
104P/Kowal 2
105P/Singer Brewster
106P/Schuster
107P/Wilson-Harrington
108P/Ciffréo
109P/Swift-Tuttle
110P/Hartley 3
111P/Helin-Roman-Crockett
112P/Urata-Niijima
113P/Spitaler
114P/Wiseman-Skiff
115P/Maury

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The Last 25 Comets to Receive Old-Style Provisional Letter Designations

Listed below, for handy reference, are the last 25 comets to have been given letter designations in the old system (as of 1994 Dec. 28), which ceased at the end of 1994. After the "equal sign" is given the name, preceded by a star (⋆) if the comet was a new discovery (compared to a recovery from predictions of a previously-known short-period comet). Also given are such values as the orbital period (in years) for periodic comets, date of perihelion, T (month/date/year), and the perihelion distance (q, in AU). Four-digit numbers in the last column indicate the *IAU Circular* containing the discovery/recovery announcement.

Old			*New-Style Designation*	*P*	*T*	*q*	*IAUC*
1993t	=	⋆	P/1993 X1 (Kushida-Muramatsu)	7.4	12/10/93	2.7	5903
1993u	=		114P/1993 X2 (Wiseman-Skiff)	6.5	6/4/93	1.5	5908
1993v	=	⋆	C/1993 Y1 (McNaught-Russell)		3/31/94	0.87	5910
1994a	=	⋆	P/1994 A1 (Kushida)	7.4	12/12/93	1.4	5918
1994b	=		86P (Wild 3)	6.9	7/21/94	2.3	5933
1994c	=	⋆	C/1994 E1 (Mueller)		12/28/93	1.8	5948
1994d	=	⋆	C/1994 E2 (Shoemaker-Levy)		5/27/94	1.16	5962
1994e	=		89P (Russell 2)	7.4	10/27/94	2.3	5967
1994f	=	⋆	C/1994 G1 (Takamizawa-Levy)		5/22/94	1.4	5974
1994g	=		51P (Harrington)	6.8	8/23/94	1.57	5982
1994h	=		115P (Maury)	8.7	3/18/94	2.0	5984
1994i	=	⋆	C/1994 J2 (Takamizawa)		6/29/94	1.95	5986
1994j	=		16P (Brooks 2)	6.9	9/1/94	1.8	5988
1994k	=	⋆	P/1994 J3 (Shoemaker 4)	14.5	10/14/94	2.9	5991
1994l	=		19P (Borrelly)	6.9	11/1/94	1.4	6009
1994m	=	⋆	C/1994 N1 (Nakamura-Nishimura-Machholz)		7/12/94	1.14	6013
1994n	=	⋆	P/1994 N2 (McNaught-Hartley)	20.8	12/8/94	2.5	6014
1994o	=	⋆	P/1994 P1 (Machholz 2)	5.2	9/18/94	0.75	6053
1994p	=		30P (Reinmuth 1)	7.3	9/3/95	1.9	6072
1994q	=		77P (Longmore)	7.0	10/9/95	2.4	6084
1994r	=	⋆	C/1994 T1 (Machholz)		10/2/94	1.8	6091
1994s	=		22P (Kopff)	6.4	7/2/96	1.6	6111
1994t	=		71P (Clark)	5.5	5/31/95	1.6	6112
1994u	=	⋆	P/1994 X1 (McNaught-Russell)	15.3	9/6/94	1.3	6115
1994v	=		P/1990 B1 = 1994 V1 (Wild 4)	6.2	8/31/96	2.0	6121

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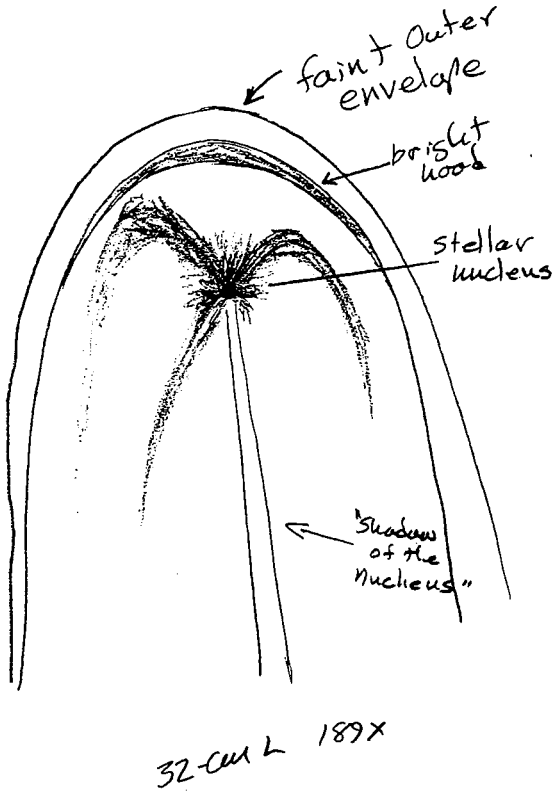
— CORRIGENDUM —

• In the October 1994 issue, page 179, "Table 1", final column heading, *for* (magnitude) *read* (Δ magnitude)

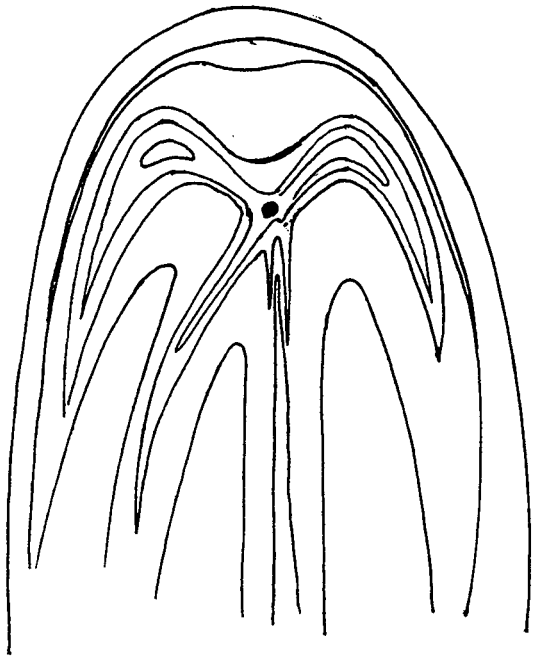
— OBSERVING AND DEPICTING NEAR-NUCLEUS STRUCTURE IN COMETS —

There were four illustrations that were accidentally not included with the article under this title by John E. Bortle in the October 1994 issue (pp. 141-143). We include these four drawings below.

ROUGH FIELD SKETCH
AT THE EYEPIECE

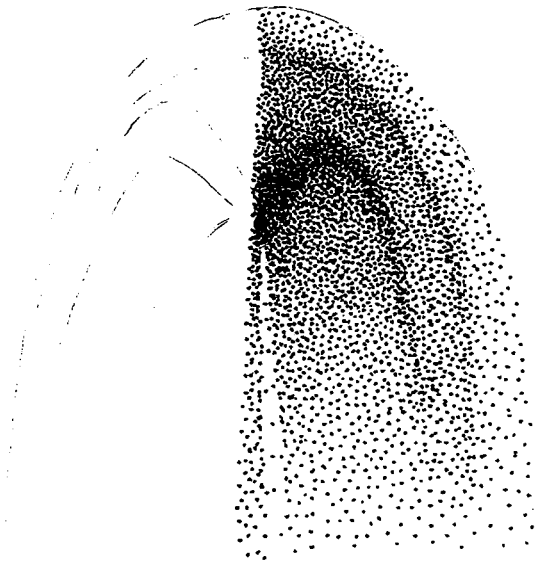


PSEUDO-ISOPHOTO DRAWING



NEGATIVE SHADING DRAWING

STIPPLE DRAWING



The New Outer Solar System

Below is a diagram representing a view of orbits of outer-solar-system objects, looking down so that the objects move counterclockwise and the vernal equinox is directly to the right. The known trans-Neptunian objects (TNOs) are marked with a filled circle to show their current locations (as are the major planets Uranus and Neptune). The orbits of all of the TNOs are still highly indeterminate (except for 1992 QB_1 and 1993 FW), and observations are greatly needed for all of them.

The inner two concentric circles closest to the sun (central dot) represent the orbits of Jupiter and Saturn. Some additional highly-unusual objects are represented by letters: C = (2060) Chiron; D = (5335) Damocles; H = (944) Hidalgo; P = (5145) Pholus; HA_2 = 1993 HA_2; TA = 1994 TA. The year is left off the designations for the TNOs: 1992 QB_1, 1993 FW, 1993 RO, 1993 RP, 1993 SB, 1993 SC, 1994 ES_2, 1994 EV_3, 1994 GV_9, 1994 JS, 1994 JV, 1994 JQ_1, 1994 JR_1, 1994 TB, 1994 TG, 1994 TH, 1994 TG_2.

This diagram was produced courtesy of Gareth V. Williams, Minor Planet Center.