THE INTERNATIONAL COMET QUARTERLY

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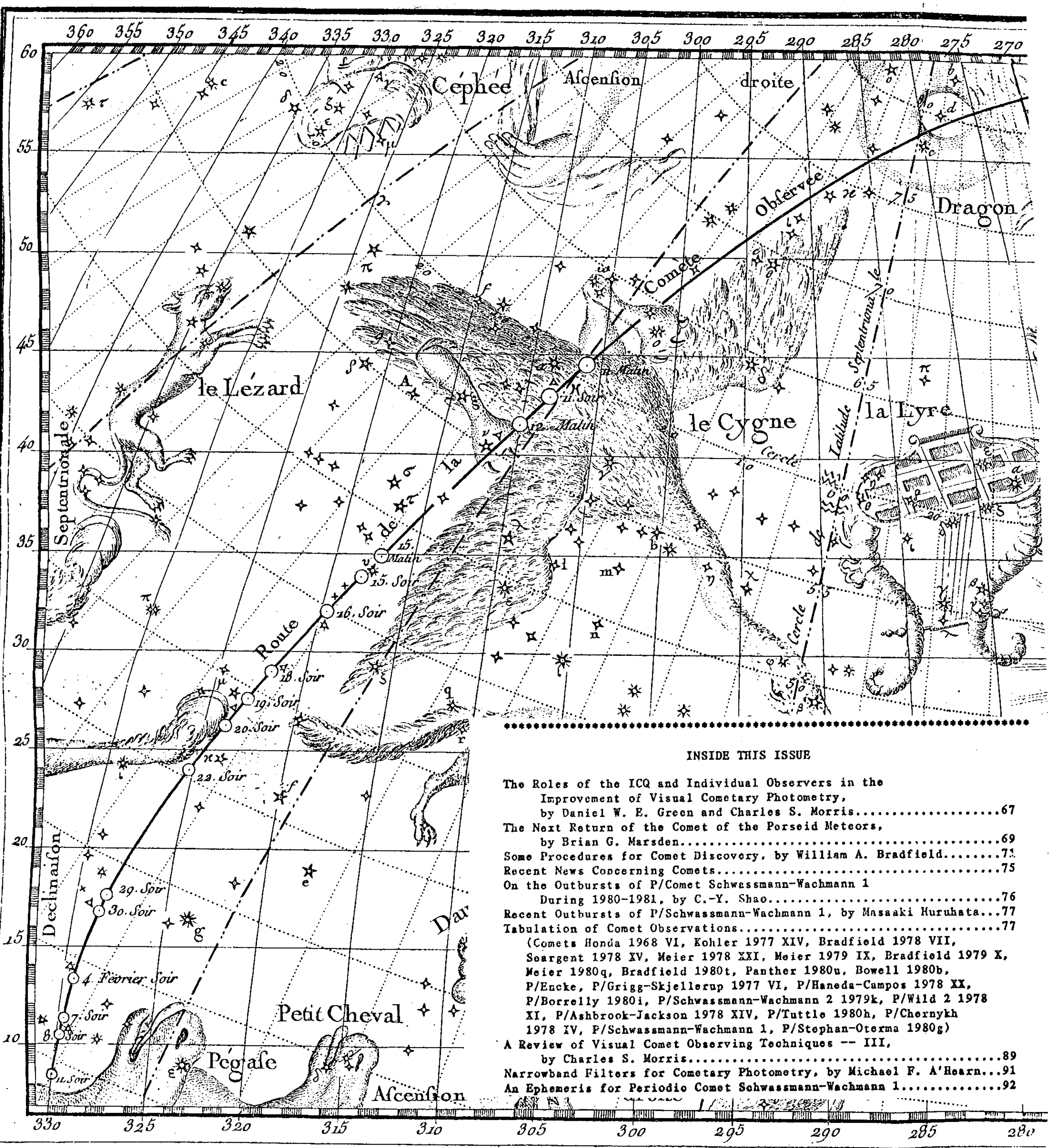

INSIDE THIS ISSUE

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

The subscription rate is $10.00 per year. Subscribers who do not wish to be billed (and who will therefore keep record of their expiration date; the last issue which a special subscriber is entitled to receive is given in the last group of digits in the upper-left-hand corner of the address label) may subscribe at the rate of $5.00/year. Make checks or money orders payable in U.S. funds to THE INTERNATIONAL COMET QUARTERLY and send to D. Green at P-329, S.A.O.; 60 Garden St.; Cambridge, MA 02138, U.S.A. Group subscription rates and advertising rates are available upon request.

Manuscripts will be reviewed for publication; they should be typewritten and double-spaced, and should be sent to the Editor at the above address. All cometary observations should be sent to C. S. Morris; Prospect Hill Rd.; Harvard, MA 01451, U.S.A. Back issues are available from Dr. T. L. Rokoske, Dept. of Physics and Astronomy; A.S.U.; Boone, NC 28608, U.S.A.

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FROM THE EDITOR

Due to increasing postage rates, we must announce another subscription rate increase. Effective September 1, 1981, the special subscription rate will increase from $5.00 to $6.00 per year. The regular (invoiced) subscription rate will remain unchanged ($10.00/year). Our computer accounting program, which is the same one used for the IAU Circulars and the MPC's, does not allow extensions of subscriptions before an increase occurs; this is because the program subtracts the CURRENT-rate-per-single-issue each time the program is run (i.e., every 3 months). Thus, it does not help to subscribe at the current rate for 2 or 3 years in advance, because all subscribers will ultimately pay the same price for each ICQ issue.

Also, all special, or non-invoiced, subscribers are asked to keep track of their expiration dates. ALL back issues of the ICQ now cost $2.50 per copy, so forgetting to renew your subscription on time (promptly) will cost you $0.75 extra per issue for missing back issues (with no exceptions). The numbering used in the present accounting system to indicate expirations is THE COMET number, which is published on the second page of each issue of the ICQ.

There is also a problem concerning ICQ addresses. Individuals sending subscription or editorial material to the Editor should use the following address:

Daniel Green
Smithsonian Astrophysical Obs.
60 Garden Street
Cambridge, MA 02138.

Do NOT use the words, "INTERNATIONAL COMET QUARTERLY" anywhere in the address, for quicker delivery.

Special thanks are due Alain C. Porter, Center for Astrophysics, for recent help with ICQ proofreading.

--Daniel W. E. Green (1981 June 20)

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COVER: Drawing of the path of the Comet of 1764 by Messier, from Mem. de l'Ac. R. des Sc. An. 1771, p. 516, Pl. IX. Supplied by Dr. O. Gingerich, Harvard-Smithsonian Center for Astrophysics.

THE ROLES OF THE ICQ AND INDIVIDUAL OBSERVERS IN THE IMPROVEMENT OF VISUAL COMETARY PHOTOMETRY

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Harvard-Smithsonian Center for Astrophysics

and

Charles S. Morris
Prospect Hill Observatory, Harvard, Massachusetts

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ABSTRACT. The roles of the ICQ and individual observers are discussed, and steps are suggested to improve the quality of total visual magnitude estimates of comets.

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The International Comet Quarterly was organized in the second half of 1978 to provide a published, readily-accessible "clearinghouse" for physical observations of comets. In less than 3 years, the ICQ′s circulation has increased dramatically, with more than half of the subscription list now consisting of professional libraries and of individual professional astronomers.

The Editors have strived to make the ICQ a valuable contribution to cometary astronomy by making physical observations of comets easily accessible to all interested groups and individuals throughout the world. Two factors in particular have been instrumental in bringing the ICQ to its present stage: 1) The publishing and mailing of this journal is handled by the Physics and Astronomy Department at Appalachian State University in Boone, North Carolina, under the direction of Dr. Thomas Rokoske. This tremendous service allows the subscription price to remain as low as it is for both domestic (U.S. and Canada) and international subscribers, thereby producing a much larger circulation. 2) The use of the Digital VAX 11/780 computer at the Harvard-Smithsonian Center for Astrophysics in Cambridge (for the compilation and reduction of photometric observations, for preparing ICQ text and graphical illustrations, and for subscription and mailing accounting purposes) has assured prompt publishing of current data and large-scale publishing of older photometric data. Dr. Brian Marsden, Center for Astrophysics, has generously provided much support and advice in the entire editorial process.

Documenting the physical observations of comets is the backbone of this journal, although the ICQ welcomes articles and publishes news notes concerning all aspects of cometary astronomy. To date, we have published more than 5,000 physical observations of comets; of these observations which we publish, it is our belief that the most useful are the brightness estimates. Currently, professional astronomers are using narrowband photometry, spectrophotometry, and other techniques to unlock the secrets of comets; relating their results to visual observations is a logical course for many investigations. Thus, it is clear that visual photometric data can be useful. (Note that variable star groups, such as the AAVSO, have aided professionals for years by providing visual light curve data.) There is one problem, however: for visual comet magnitude data to be of use to professionals, the observations must be of relatively high quality.

We have, in the past, attempted to improve the quality of the data that we receive, by encouraging the reporting of: 1) estimates to tenths of a magnitude, 2) acceptable

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comparison star references, 3) details concerning instrumentation, and 4) the methods used in making the estimates. Despite the generally-positive response to these requests by observers who contribute to the ICQ, the data received on some recent comets continues to show unacceptable scatter. A striking example of this is P/Stephan-Oterma 1980g. Figure 1 depicts the light curve of this comet, using 168 observations reported to the ICQ, and illustrates the difficulty in unambiguously reducing the data (cf. Green and Morris 1981).

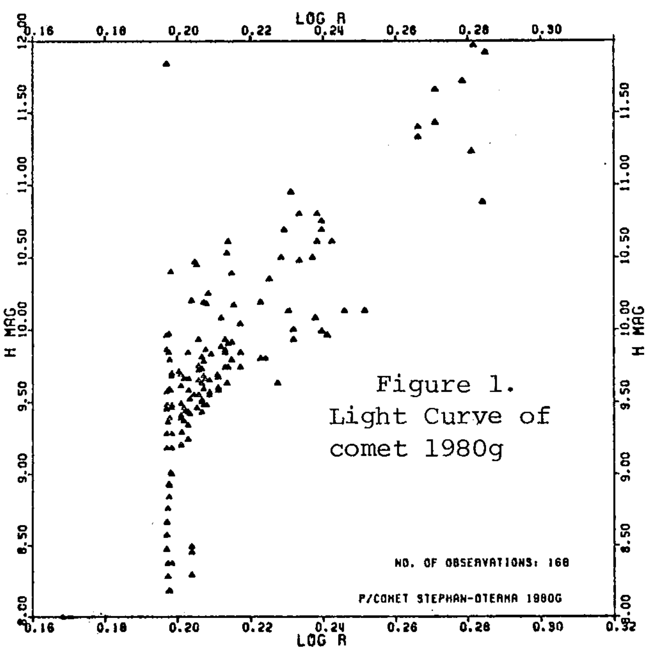

Figure 1. Light Curve of comet 1980g

There are two reasons for which we are concerned about the large scatter in observational data. First, the scatter is not random; if it were random, one would expect photometric solutions to be independent of the scatter. Unfortunately, there is a tendency, particularly by the more inexperienced observers, to underestimate the brightness of comets. Another systematic effect occurs because of failure to account for differential extinction when the comet is near the horizon. If the comet is substantially below the comparison stars, the resulting brightness estimates could be faint by more than a magnitude. Many other systematic effects can also occur; most of these lead to fainter magnitude estimates.

The second reason for which we are concerned about the observational scatter in light curves is that it can mask real, intrinsic light fluctuations of the comet. A case in point is the minor flare (of about 1 magnitude) experienced by comet Bradfield 1979l (cf. Morris 1980). When all of the observations are combined, the flare is obscured even though observations of many individual observers suggest its presence.

THE ICQ'S ROLE.

It is our belief that the ICQ has an important role in the improvement of visual photometry of comets. Thus, we are proposing the following steps which should ultimately yield higher-quality data:

1) As is currently our practice, we will continue to not publish magnitude observations for which the instrument aperture and type are not known. Furthermore, observations having only approximate magnitude estimates (i.e., to the whole magnitude) usually will not be included in the ICQ data tabulation, unless the observation is considered critical to a certain portion of the light curve.

2) Beginning with all 1982 observations, acceptable comparison star references must be used and reported with magnitude estimates to warrant publication in the ICQ.

3) In conjunction with this last step, we will review potential comparison star references and make recommendations concerning their use. Presently, we expect to publish this review in the next issue of the ICQ.

4) In the near future, we will review the problem of differential atmospheric extinction correction, as applied to comet magnitudes. We

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will present recommendations on the best way to handle this problem for both the observers and those analyzing the data.

5) After sufficient data have been collected, we will evaluate the various methods for making total magnitude estimates (cf. Morris 1980), and we will suggest guidelines for their use.

6) We expect continually to review the situation, and may revise criteria and requirements for publishing data in the ICQ where appropriate or necessary.

The ICQ Editors encourage individuals and groups to comment on, and to provide input to, our program.

THE OBSERVER'S ROLE.

Ultimately, the quality of the data submitted to the ICQ is the responsibility of the observer. No guidelines, suggestions, or policies of the ICQ or any other group will have any effect on the quality of the photometric data if the observer ignores them.

Experience is very important. In order for one to become a proficient observer, it is necessary to observe a large number of comets. This means not only observing the spectacularly bright comets, but also the fainter, perhaps less impressive objects. This way the observer is exposed to a wide range of comet morphologies and observing conditions.

Whether the observer is experienced or is a newcomer, there are several steps which he can take to improve the quality of their observations. These include:

1) Double checking any estimate which suggests dramatic changes in brightness that would not normally be expected. Although comets sometimes vary dramatically over short periods of time, most comets do not, and sudden changes in brightness should arouse suspicion.
Such brightness "fluctuations" may be the result of switching comparison star sequences from one night to the next or of other artificially-induced factors.

2) Comparison stars should be selected prior to going to the telescope. If possible, a secondary set of comparison stars should also be available for a double check of the magnitude estimate.

3) Care should be taken not to "observe the ephemeris." This is a common problem for inexperienced observers. Published ephemerides are intended only as rough guides to a comet's brightness.

4) Follow the observing guidelines recommended by Morris (1980).

5) After a comet's apparition, the observer should review his observations and compare them with other published data to determine if major discrepancies exist. Particular attention should be paid to the observations of very experienced observers (e.g., John E. Bortle, ICQ Observer Code "BOR"). If significant differences are found, an attempt should be made to determine the reason, so that the problem can be rectified in future observations.

REFERENCES

Green, D. W. E., and C. S. Morris (1981). ICQ 3, 42.
Morris, C. S. (1980). ICQ 2, 24.

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THE NEXT RETURN OF THE COMET OF THE PERSEID METEORS

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ABSTRACT. The prospects for recovery of comet 1862 III (P/Swift-Tuttle) are discussed, based upon its 1862 apparition and upon possible identifications with previous comets.

THE NEXT RETURN OF THE COMET OF THE PERSEID METEORS

In a paper published under the above title some eight years ago (Marsden 1973), I made a redetermination of the orbit of this celebrated comet and provided aids for recovery attempts at the comet's next -- now impending -- return. As I pointed out at the time, the situation was very uncertain, and in spite of recent implications to the contrary (Bortle 1981a, 1981b), the situation has not changed.

The comet was discovered in July 1862 independently by more than half a dozen observers in North America and Europe, and in recent catalogues it has generally gone by the name P/Swift-Tuttle. The fact that the comet has a revolution period of some 110-120 years was first recognized by Stampfer (1862), and Schiaparelli (1867) pointed out the striking resemblance between the orbits of the comet and the Perseid meteor stream, including the fact that the comet's revolution period roughly coincided with the intervals between series of intense displays of Perseids. Hayn (1889) suggested that the comet's revolution period was 120 ± 2 years; I tended to agree with his estimate of the uncertainty, and since allowance for the planetary perturbations has the effect of reducing the actual interval between perihelion passages by about a year, I deduced that the current return should be some time during 1979-1983.

Although the formal date for the current return is in the latter part of 1981, there is no reason why searches should be concentrated particularly near this time. The fit to the 1862 observations is not as good as it should be, possibly due to neglected nongravitational forces, and one cannot therefore expect the possible perihelion dates to be represented by a Gaussian distribution centered on late 1981.

The comet was a conspicuous object in 1862, and it is curious that there are no obvious identifications of it at earlier passages through perihelion. Unless the comet was anomalously bright in 1862, it would have been at least as bright whenever perihelion passage took place between late June and early September, and on a chance basis this would have happened every five or six revolutions; there would seem to be a fair chance that the comet would have been observed at one return out of two.

It could be, however, that the planetary perturbations on the comet conspired in such a way as to put the comet's perihelion time at an unfavorable time of the year on several consecutive occasions prior to 1862. If this is so, then certain values of the perihelion time during 1979-1983 would be excluded. It would, in fact, be most probable that perihelion passage would take place during the intervals March-November 1980, April-December 1981, or May-December 1982. It so happens that these intervals coincide with the best periods of the year for visibility of the comet, but there is no particular preference for one year over another (although perihelion passage presumably did not take place during the 1980 window).

There are records of two earlier comets that might have been P/Swift-Tuttle. One of these is comet 1737 II, the identity of which with P/Swift-Tuttle was originally suggested by Lynn (1902). If this was P/Swift-Tuttle, the comet's revolution period is a decade or so longer than generally believed, but this should not be regarded as completely out of the question; if the identity is correct, the comet's return can be expected in November 1992.

The other earlier comet is one observed in 69 B.C. Even if this was P/Swift-Tuttle, it appeared too long ago to help refine the prediction. Nakano (1980) has suggested that it gives a perihelion date of May 1981, but my guess is that nongravitational forces acting on the comet could change this date by more

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than a year.

The Central Telegram Bureau has already received two false alarms of claims of the recovery of P/Swift-Tuttle. Each claim resulted from photographs obtained while the comet was allegedly far from the earth, and they suggested perihelion dates in May 1981 and November 1981, respectively. My 1973 paper gives ephemerides for searches that might be made for the comet within 100 days of perihelion. I suggest that amateurs interested in visual searches for new comets use these. Even if they don't in fact produce P/Swift-Tuttle, they could always lead to the discovery of some unexpected comet. . . .

REFERENCES

Bortle, J. E. (1981a). Brooks Obs. Circ. No. 19.
——— (1981b). Sky Telesc. 62, 29.
Hayn, F. (1889). Inaugural dissertation, University of Gottingen, Leipzig.
Lynn, W. T. (1902). Observatory 25, 304.
Marsden, B. G. (1973). Astron. J. 78, 654.
Nakano, S. (1980). Nakano Note No. 377.
Schiaparelli, G. (1867). Astron. Nachr. 68, 331.
Stampfer, S. (1862). Astron. Nachr. 58, 203.

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SOME PROCEDURES FOR COMET DISCOVERY

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ABSTRACT. The comet hunting techniques with which the author has discovered his eleven comets are discussed, and the circumstances surrounding the discoveries of the eleven comets are presented.

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This article describes some aspects of the comet-hunting procedures adopted by the author during 10 years of personal experience with a portable 6-inch-aperture f/5.5 refractor. A complementary article, which describes the telescope in more detail, was published in Sky and Telesc. 53, p. 306 (April 1977).

The author lives in a northeastern suburb of Adelaide, the capital city of the state of South Australia, where there is exposure to the intensity of light pollution associated with a population of about 900,000 people. For comet hunting, darker skies are obtained by motoring for about 45 to 60 minutes, over road distances varying from 26 to 42 miles, to sparsely populated country locations northeast or north of the city. Some sky glow can be seen from the observing sites in the direction of Adelaide, but the skies toward the east and west easily show the Zodiacal Light. The possession of mobility enables sites to be varied to avoid undesirable local weather conditions such as fog and stationary low clouds. All of the observing sites are chosen to be clear of headlight illumination from motor vehicles which may happen to pass along nearby little-used roads.

On reaching an observing site, dark adaptation of the eyes is assisted by avoiding the use of artificial light when assembling telescope equipment. During observing at the eyepiece, the author's head is semi-enclosed in a cardboard box fitted over the eyepiece to reduce the amount of light reaching the eye which is not passing through the telescope itself. A low-intensity red light is used as little as possible when reference to a star chart becomes absolutely necessary.

A regular search program is conducted throughout the whole year for both the morning and evening, with the aim of accumulating at least 100 hours annually of searching, inclusive of the time required to refer to charts for the identification of diffuse objects. The prime areas that are swept lie within 90° elongation from the sun. Although some coverage of areas beyond 90° is undertaken if weather and time permits, this activity is regarded as less productive. For visual comet hunting with telescopes, this opinion is supported by the findings of various researchers who have analyzed the discovery circumstances of comets. Information presented by E. M. Pittich (1969) gives figures for the period 1750-1967 which show that the most fruitful areas lie between 30° and 60° elongation from the sun. Interestingly, all of the author's comet discoveries were within 60° elongation from the sun.

Searches are conducted on moonless nights twice a month, weather permitting, initially during the early part of the moon-free period, and later towards the end of the period. This is necessary to catch comets as soon as they become visible, because the brightening rate for comets discoverable with a 6-inch telescope can often be more than half a magnitude in 10 days. It is also necessary to spot those comets which move out into darker skies after being shielded from view by their close angular proximity to the sun. Ideally, searches should be made in the complete absence of the moon; however, the presence of a 3-day crescent-phase moon is often tolerated. In the morning, this allows early coverage of low eastern sky when poor weather is expected during the following few days. Likewise in the evening, this may allow a late coverage of the low western sky when an earlier search is prevented by cloudly weather. A decision to consider evening sweeping depends upon there being a clear sky in the late afternoon or upon a high probability that the sky will be cloud-free in the areas of interest by the time it becomes dark. For the planning of morning sweeping the sky must be clear during the preceeding evening, or be showing signs that it will become clear in the areas of interest for a few hours before morning twilight.

Emphasis is placed on the need to maintain a good coverage of the morning sky, because more discoveries appear to have been made in the morning than in the evening. The study by Everhart (1967), indicating that morning searches are likely to be more productive, is of particular interest. Also in the morning, the viewing conditions are usually superior to those in the evening, because the man-made air pollution produced during the previous day is often dispersed. Seven of the author's eleven comet discoveries were made in the morning sky.

PROCEDURE.

Horizontal sweeps are made with an altazimuth-mounted telescope over an arc of about 50° (sometimes up to 90°). Sweeping is always done in the same direction, and not in a zig-zag mode. The author is surprised that so many past references have advocated a zig-zag pattern. This method is certainly acceptable for an equatorial-mounted telescope where sweeps are carried out at constant declination. It could also be acceptable for an altazimuth-mounted telescope where the track is less than 20° , or where the component of the star field displacement at right angles to the sweep path (during the time to do one sweep) is small com-

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pared to the field diameter. However, for comet hunting predomiminantly in western or eastern skies, where the vertical motion of the star fields is significant, a unidirectional sweeping pattern is more efficient.

On many occasions for both morning and evening operations, the author divides the sky into two parts, one which is accessible to northern-hemisphere observers located at 35° north latitude at the time of their astronomical twilight, and the second being that part below their horizon. Sweeping can be made easier and more efficient by searching in one of these two areas before attempting to cover the other (possibly on the following night). The location of the dividing line across the constellations is determined before going out for the night's search by using a planisphere which gives conditions for 35° north latitude. Sweeping of the selected part is always directed away from the dividing line.

EVENING PROCEDURE.

Normally the author commences comet hunting at the end of astronomical twilight, although if an earlier arrival at the observing site occurs, sweeping of the low sky below 10° altitude may start 10 minutes before the end of astronomical twilight. In general, sweeps are stepped upwards as rapidly as possible to enable examination of star fields at the highest possible altitude, thereby facilitating the detection of faint, diffuse objects. Adjustment of the telescope for sweeping an higher, adjacent, horizontal path includes an allowance to offset the downward (setting) star-field motion and a small allowance for star-field overlap (about 1/8 of the field diameter). The angular displacement of the telescope for the start of another sweep depends on the sweep time that relates to the length of the sweep. For an observer's latitude of 35°, the maximum possible vertical star-field motion is 0.25 cos 35 degrees per minute. Assuming a 2-minute sweep time, the maximum downward star-field motion due west is ~ 0°.4.

As an example, if the diameter of the star field as seen through the telescope is 2° and an overlap of 1/4 degree is choosen, the telescope is moved upward for the start of the next sweep by 1°.35. This amount is judged as a fraction of the 2° field of view, the adjustment being made with the eye at the eyepiece. There is no need for precision, as the overlap of 1/4 degree allows for some variability. If a sweep takes a longer time, the upward adjustment of the telescope must be correspondingly restricted, or there will be a danger of missing strips of stars. In the above determination of telescope movement, it is assumed that sweeping passes through the west point where the vertical star field motion is greatest. On either side of the west point where the vertical downward motion is less, this choice of telescope movement will give more than necessary overlap of starfields towards the north or south, but this is unavoidable. When sweeping is stopped to investigate a diffuse object, the telescope is moved slightly downwards before the resumption of the sweep so that the object is placed in the original position in the field.

MORNING PROCEDURE.

For the morning operations, one could work in reverse to the evening procedure by starting sweeps at high altitude and gradually moving towards the horizon, so as to reach the low level at the end of darkness. In practice, this is difficult to achieve precisely. There may be a tendency to arrive at the low level too soon, so that star fields are searched at a disadvantage by being examined at a lower than desirable altitude. At the start of the author's comet-hunting

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experiences, a habit of always working upwards was established and has been maintained because it appeared to be more manageable. This procedure involves sweeping star fields in stages, the first one beginning at 20° altitude, starting an hour and a half, or possibly two hours, before twilight. Sweeps are staggered upwards, perhaps to 60° altitude, and then dropped to a new low starting level at about 15° altitude, to work upwards again to reach and stop at the star fields already searched. When the upper previously-searched fields are reached there will be a tendency to overlap the upper fields located away from the east point. A third start is made at a low level of about 10° altitude, working upwards, to be followed finally by a scan at very low level. This latter activity could take in about 10 minutes of twilight time, sometimes more. Unlike for evening operations, the upwards staggering of sweeps in the morning gives little chance of missing out strips of stars, so that a much simpler procedure for determining the amount of telescope displacement for each successive adjacent sweep can be adopted. The telescope is moved up exactly by one field diameter. For the example considered previously with a 2-degree-diameter field, this procedure will give a more-than-necessary overlap near the east point if the sweep times are much longer than 1.25 minutes, but this can be accepted. In carrying out the various stages of the morning search, there must be an awareness of the approach of twilight so that as much as possible of the chosen areas are covered before twilight occurs.

CONCLUSION.

The author is presently undertaking a regular comet search program, and hopes to maintain for the forseeable future a continued discovery rate averaging out at one comet per year.

From the commencement of the program on 1971 January 1, 1645 hunting hours have been accumulated to 1981 April 30. Search hours to achieve each comet discovery, giving a total of 1596 hours for eleven discoveries, are listed below.

TABLE I. BRADFIELD'S COMETS

Comet: Prov. Desig.	Comet: Roman Desig.	Discovery Date (UT)	Disc. Mag. (m_1)	Search Hours	Ref.: IAUC	Days from New Moon	Days before or after Perihelion	Elong.
1972f	1972 III	1972 Mar. 12.8	10	260	2392	3 before	15 before	31°
1974b	1974 III	1974 Feb. 12.5	9	306	2633	10 before	34 before	33
1975d	1975 V	1975 Mar. 12.4	9	145	2759	0.5 before	23 before	30
1975p	1975 XI	1975 Nov. 11.7	10	106	2866	8 after	39.5 before	57
1976a	1976 IV	1976 Feb. 19.5	9	57	2914	10.5 before*	5 before	56
1976d	1976 V	1976 Mar. 3.8	9	9	2923	3 after	7.5 after	44
1978c	1978 VII	1978 Feb. 4.8	8	360	3170	3 before	41 before	48
1978o	1978 XVIII	1978 Oct. 10.8	9	75	3286	8.5 after**	11.5 after	32
1979c	1979 VII	1979 June 24.4	10	98	3372	0	29 before	44
1979l	1979 X	1979 Dec. 24.8	5	67	3437	5.5 after	3 after	27
1980t		1980 Dec. 17.8	6	113	3554	10 after***	12 before	22

NOTES: * 4 days after full moon. ** 5.5 days before full moon. *** 4 days before full moon.
COLUMNS: 1) Provisional designation of comet; 2) Roman numeral designation of comet; 3) Discovery date in Universal Time; 4) Approximate total visual magnitude at discovery; 5) Number of search hours to find comet (counted from previous comet discovery); 6) IAU Circular reference #, giving the Circular on which the discovery was announced; 7) Number of days before or after new moon at the time of discovery; 8) Number of days before or after perihelion at the time of discovery; 9) The comet's elongation from the sun in degrees at the time of discovery.
This table was compiled by D. W. E. Green and W. A. Bradfield.

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REFERENCES

Pittich, E. M. (1969). "The Selection Effects on the Discoveries of New Comets", Bulletin of the Astronomical Institutes of Czechoslovakia 20, No. 3.

Everhart, E. (1967). "Comet Discoveries and Observational Selection", A.J. 72, p. 716.

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RECENT NEWS CONCERNING COMETS

S. J. Bus discovered his second comet of the year, comet 1981d, on a plate exposed with the 46-cm (18-inch) Schmidt telescope at Palomar on April 26. The object was near magnitude 16.5, moving northwestward in Libra (cf. IAU Circ. No. 3598). This object is fading in brightness.

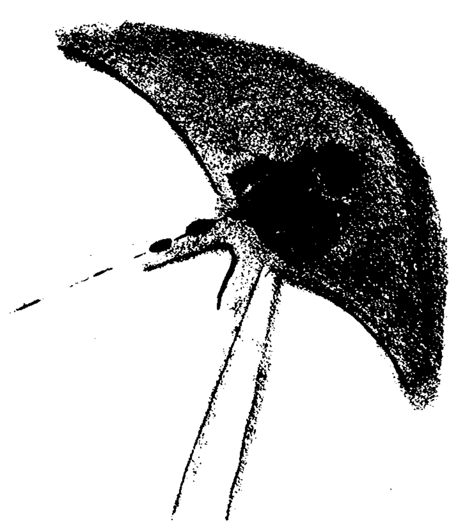
The recovery of P/Finlay (1981e) was reported by M. P. Candy and P. Jekabsons, Perth Observatory, from plates exposed May 7 and 8; at magnitude 16, this object should not get brighter (cf. IAUC 3603).

Skepticism still surrounds the possible recovery of P/Gehrels 2, designated comet 1981f, by A. Cochran at McDonald Observatory on June 8 and 9. Reported at magnitude 9, this comet has not been definitely observed by any other observers. (cf. IAUC 3612)

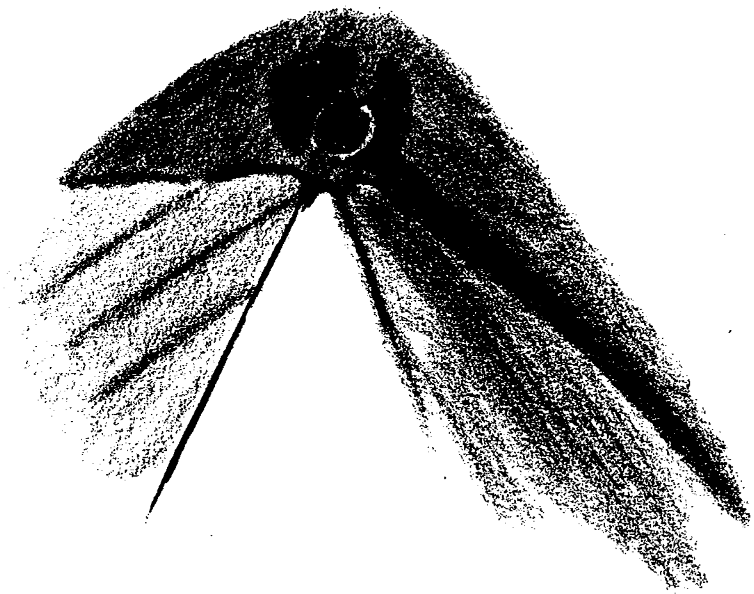
P/Schwassmann-Wachmann 1 has undergone outbursts in February and April which brought this comet within the range of modest visual observing equipment. Some of the visual reports of this object are published in the Tabulation of Comet Observations elsewhere in this issue, and two individual accounts by observers with larger telescopes are given in the following two articles.

Comet Bradfield 1980t was apparently photographed near magnitude 19 by C.-Y. Shao with the 155-cm reflector at Oak Ridge Observatory on June 29 UT. No other astrometric observations had been reported since January 26, and this is the first observation of any kind (visual or otherwise) of comet 1980t since early February. Stephen O'Meara made the following 3 drawings of this comet from observations at the eyepiece of the 9-inch (23-cm) Clark refractor at Harvard College Observatory in Cambridge, Massachusetts in January; a magnification of 645x was used for the inner coma detail.

--D. W. E. Green (1981 July 1)



At right is a drawing of comet Bradfield 1980t, with detail of the inner coma as observed by S. O'Meara (see previous page) on 1981 January 21 at 22:40 UT. On the previous page, the two drawings were made on January 19 at 23:00 UT and on January 20 at 22:40, respectively.



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ON THE OUTBURSTS OF P/COMET SCHWASSMANN-WACHMANN 1 DURING 1980-1981

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At Harvard's Agassiz Station (now renamed Oak Ridge Observatory), we frequently observe P/Schwassmann-Wachmann 1 both visually and photographically. We have obtained one or more exposures during each lunation from 1980 December to 1981 May, and our record indicates that except on December 15, when it was faint, the comet was always in some stage of an outburst during the 6-month period; P/Schwassmann-Wachmann 1 was indeed unusually active during this past opposition.

Most interesting was the outburst in February (see Sky & Telesc. 61, p. 390), during which material ejected from the comet formed a spectacular spiral coma. An exposure on March 28 revealed the comet as a sharp nuclear image with a weak envelope. But when we recorded the comet on April 23, it had brightened again and was then composed of two concentric comae; the inner coma was bright (magnitude 10-11), embedded in a fainter and larger outer one of about 30" in diameter. Both comae were very compact and circular in form, perhaps expelled from the comet a few days apart.

Our last exposure was taken on May 8, when the nucleus was of magnitude ~ 17-18 with an extensive coma (about 1' diameter). All photographs were made on hydrogen-sensitized Kodak IIIa-F emulsion through a blue filter at the f/5 focus of the 155-cm reflector.

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UNIVERSAL TIME (UT): This time based on the Greenwich meridian is used throughout the ICQ; it is 24-hour time, from midnight to midnight. In North America, add the following numbers to standard times to convert to UT: EST, 5; CST, 6; MST, 7; PST, 8. For daylight savings time, add 4, 5, 6, and 7 hours, respectively.

RECENT OUTBURSTS OF P/SCHWASSMANN-WACHMANN 1

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ABSTRACT. V and B magnitudes of P/Schwassmann-Wachmann 1 obtained during its recent outbursts are presented.

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During the current observing season, no unusual activity was seen from the end of October until February 5, when a brightness outburst was detected; a second one was detected on April 20. Two cameras were used to obtain total visual and photographic magnitudes. A 10-cm lens (focal length 50 cm) was used with Tri-X film and a yellow-green filter, which gives values very close to V magnitudes. A 16-cm reflector (focal length 130 cm) was used with Kodak 103a-O film for the photographic magnitudes. All exposures were 10 minutes in duration.

The measurements were made by direct visual estimations from the photographs, with a small iris photometer made especially for this purpose. The photographic magnitudes of comparison stars were determined through comparison with stars from Landolt's (1973) Selected Area No. 102. The results are given in Table I, where "VE" is visual estimation and "IP" is that measured with the iris photometer. When a star was located very close to the comet, the measurements were made by taking both comet and star in the iris and then subtracting the star; these results are indicated by asterisks (*) in Table I.

The outburst in February occurred between February 4.54 and 5.54 UT, and that in April probably occurred one or two days before April 20, judging from the starlike images of the comet. On April 25, the brightness increased by about half a magnitude; I assume that a secondary sub-outburst occurred on that day. Such a phenomenon has not been recognized in the several outbursts observed during the last three years.

*Former Director (retired) of the Tokyo Astronomical Observatory.

REFERENCE

Landolt, A. U. (1973). A.J. 78, p. 959, 1973 November.

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TABLE I. TOTAL MAGNITUDES OF P/COMET SCHWASSMANN-WACHMANN 1

DATE (1981 UT)		Visual Mag. VE	Visual Mag. IP	Blue Mag. VE	Blue Mag. IP
Feb.	4.54	>14		>15	
	5.54	13.2	12.9	13.6	13.4
	7.55	13.2	13.0	13.4	13.1
	8.80	13.5	13.0	13.7	13.2
	9.63	13.5	13.3	13.4	13.0
	10.65	13.4	13.0	-	-
	11.67	13.5	13.2	13.5	13.2
	12.67	13.4*	13.0*	13.5	13.0
Apr.	11.47	>14		>15	
	20.44	12.4	12.3	13.4	13.2
	21.44	12.3	12.0	13.2	12.3
	21.46	12.3	12.1*	12.9	12.1*
	22.44	12.2	12.2	12.9	12.5
	23.45	12.3	12.2	12.7	12.6
	23.48	12.3	12.3	12.3	12.0
	25.53	12.0	11.7	11.7	11.4
	26.44	12.1	11.7	12.2	11.8
	28.46	12.5	12.3:	12.7	12.0
	30.47	12.3	11.8	12.6	12.3

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TABULATION OF COMET OBSERVATIONS

Published here are most of the remaining unpublished A.L.P.O. observations back through 1977, as well as recent observations which have been received by the ICQ Staff. All contributing observers whose observations are published in the ICQ should check their own published data for any

TABULATION OF COMET OBSERVATIONS

possible errors. The Staff double-checks the data that is entered into the computer, and we ask that errors be reported promptly to increase the reliability of the observational data.

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FOLLOWING ARE NEW ADDITIONS TO THE OBSERVER KEY:

BER01 05 SCOTT BERRY, SC, U.S.A.
ERI 05 ROBERT ERICKSON, MI, U.S.A.
FEN 05 ANDRAS FENYVESI, HUNGARY
GRO 05 MARTIN GROSSMANN, W. GERMANY
HOR01 05 JOZSEF HORVATH, HUNGARY
JUH 05 MIHALY JUHASZ, HUNGARY
KAR01 05 ISTVAN KARASZI, HUNGARY
LAM 05 RANDY LAMBERT, TX, U.S.A.
LAU 05 ROGER LAUREYS, BELGIUM
LIN 05 R. D. LINES, AZ, U.S.A.
MER J. C. MERLIN, FRANCE
MEZ 05 CSABA MEZOSI, HUNGARY
MIL02 GIANNANTONIO MILANI, ITALY
MOC 05 MIHALY MOCSAN, HUNGARY
MUE 05 CHRISTOPH MUENKEL, W. GERMANY
NOW 05 GARY T. NOWAK, VT, U.S.A.
PAP01 05 JANOS PAPP, HUNGARY
PAP02 05 SANDOR PAPP, HUNGARY
PAR 05 MURRAY L. PARKINSON, AUSTRALIA
SIL 05 MICHAEL SILLS, OH, U.S.A.
SZE 05 BELA SZENTMARTONI, HUNGARY
SZO 05 BALAZS SZOKE, HUNGARY
VIZ 05 PETER VIZI, HUNGARY
CORRECTION:
USV 05 ANTAL UJVA´ROSY, HUNGARY
(NOT "USV")

Comet Honda (1968 VI = 1968c)

DATE (UT)	MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1968 07 12.36	8.0	A	S	15.0	L	4	22	3.0				SPR
1968 07 20.36	7.9	A	S	15.0	L	4	22	3.0				SPR
1968 07 26.34	7.9	A	S	15.0	L	4	22	4.0				SPR
1968 08 10.34	6.5	A	S	15.0	L	4	22	4.0				SPR
1968 08 12.34	6.5	A	S	15.0	L	4	22	5.0				SPR
1968 08 18.33	6.0	A	S	15.0	L	4	22	6.0				SPR
1968 08 30.34	5.5	A	S	15.0	L	4	22	8.0				SPR

Comet Kohler (1977 XIV = 1977m)

DATE (UT)	MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1977 09 08.20	9.8	A		12.0	R		20					COL
1977 09 09.20	9.8	A		20.0	L	10	40	2.0				SPR
1977 09 11.07	10.5	A		10.2	L							MIL
1977 09 11.07				40.6	L			2.5				MIL
1977 09 12.05	9.3	A	S	5.0	B		10	5.5				BOR
1977 09 12.05 *	9.6	A	S	32.0	L	6	55	5	3/			BOR

Comet Kohler (1977 XIV = 1977m) Cont.

DATE (UT)		MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1977 09 12.07	*				23.0	R	12				0.22	335	OME
1977 09 12.07	*	9.6	A		23.0	R	12		8		0.25	30	OME
1977 09 13.06		10.7			15.2	R	5						SHE
1977 09 13.07		9.4	A		23.0	R	12		5			33	OME
1977 09 13.19		10.0	A		20.0	L	10	40	4.5				SPR
1977 09 15.03		10.0	A		11.4	L		70	& 3.5	1			MAT02
1977 09 15.04		9.1	A	S	5.0	B		10	5.3				BOR
1977 09 15.04		9.4	A	S	32.0	L	6	55	6	3/			BOR
1977 09 15.08		8.8	A		7.6	R							OME
1977 09 15.08		9.4	A		23.0	R	12		10		0.33	335	OME
1977 09 15.08					23.0	R	12				0.08	26	OME
1977 09 15.1		9.2	A		5.0	B		10					LAM
1977 09 15.1					20.3	C	10	50	4	3			LAM
1977 09 16.1		9.9	S		15.2	R	5		4				SHE
1977 09 17.05		9.2			13.0	R		20					MAL
1977 09 17.1		9.9			31.8	L	5		7				SHE
1977 09 17.21		10.0	A		20.0	L	10	40	3.5				SPR
1977 09 18.05		9.2			13.0	R		20					MAL
1977 09 18.2					20.3	C		50	5	1			OHA
1977 09 19.05		9.1			13.0	R		20					MAL
1977 09 20.1	*	9.2			31.8	L	5			3	0.17	350	SHE
1977 09 21.07		9.1			13.0	R		20					MAL
1977 09 22.06		9.0			13.0	R		20					MAL
1977 09 24.06		9.0			13.0	R		20					MAL
1977 09 25.06		9.0			13.0	R		20					MAL
1977 09 25.08		9.4:	S		15.2	L	8	32		2/			KR002
1977 09 26.06		8.9			13.0	R		20					MAL
1977 09 27.05		8.8			13.0	R		20					MAL
1977 09 27.09		9.1	S		15.2	L	8	32	& 2	0/			KR002
1977 09 27.20		9.0	A		20.0	L	10	40	5.0				SPR
1977 09 28.01		8.8:	A	S	32.0	L	6	55	2.4				BOR
1977 09 28.06		8.8			13.0	R		20					MAL
1977 09 28.10		8.7	A		23.0	R	12		10		0.25	30	OME
1977 09 28.10					23.0	R	12				0.25	315	OME
1977 09 28.10					23.0	R	12				0.25	353	OME
1977 09 28.78		9.2	V		6.3	R		30	& 1.8	4/			USV
1977 09 29.02		9.0	A		11.4	L		40	& 2.5	1/			MAT02
1977 09 29.06		8.7			13.0	R		20					MAL
1977 09 29.77		8.0:			15.5	L	7	33	5	2			FUL
1977 09 30.09					23.0	R	12				0.20	45	OME
1977 09 30.09		8.4	A		23.0	R	12		8		0.30	350	OME
1977 09 30.09					23.0	R	12				0.13	315	OME
1977 09 30.1		8.6			13.0	R		20					MAL
1977 09 30.77		9.1	V		6.3	R		30	& 2	4			USV
1977 09 30.77		9.0	V		10.0	L		25	&10	6			TUB
1977 09 30.81		8.4	V		15.0	L		50	& 4	5			KAR01
1977 10 01.09		8.5			13.0	R		20					MAL
1977 10 01.20		8.5	A		20.0	L	10	40	5.0				SPR
1977 10 01.75		8.6	V		15.0	L		50	& 5	1/			KAR01
1977 10 02.08		8.4			13.0	R		20					MAL
1977 10 02.1		8.9	V		6.3	R		30	& 4	4			USV
1977 10 02.8		8.5	S		20.3	C		50	10	5	0.17	310	BAR
1977 10 02.8		7.7	S	S	8.0	B		20	5	4	0.22	42	CAV
1977 10 02.80		8.5	S		8.0	R		25	& 5.8	5/			PAP01

Comet Kohler (1977 XIV = 1977m) Cont.

DATE (UT)		MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1977 10 03.05		8.0	S		15.2	L	8	32	3.5	5			KRO02
1977 10 03.74		8.6	V		20.0	L		60	4	4			PAP02
1977 10 03.75		8.7	V		7.5	R		45	& 5.5	2			SZE
1977 10 03.76		8.1	V		12.0	L		50	12	0/			MEZ
1977 10 03.81		8.1	V		15.0	L		50	& 5	6			KAR01
1977 10 03.81	*	8.8	V		6.3	R		30	& 5	2/			USV
1977 10 04.05	*	7.8	S	B	11.0	R	10	26		2			BEN01
1977 10 04.07		8.2			13.0	R		20					MAL
1977 10 04.1		7.9			15.2	L	8	32		5/			KRO02
1977 10 04.18		8.7	A		20.0	L	10	40	3.0				SPR
1977 10 04.75		8.2			10.0	L		25	12	4/			TUB
1977 10 04.80		8.4	S		8.0	R		25	6.2	7			PAP01
1977 10 05.01		8.8	A		11.4	L		40	& 3.5	3/			MAT02
1977 10 05.05		8.2			13.0	R		20					MAL
1977 10 05.12					23.0	R	12				0.20	315	OME
1977 10 05.12		8.0	A		23.0	R	12		8		0.25	45	OME
1977 10 05.12					23.0	R	12				0.33	350	OME
1977 10 05.76		8.6	V		7.5	R		45	& 6	2			SZE
1977 10 06.03		7.9	S		11.0	R	10	26		2/			BEN01
1977 10 06.05		8.2			13.0	R		20					MAL
1977 10 06.77		8.2			20.0	L		40	& 5	3			HOR01
1977 10 07.0	*	8.58	E		24.1	R	15		& 6.5	5			SAB
1977 10 07.06		8.1			13.0	R		20					MAL
1977 10 07.11					23.0	R	12				0.30	5	OME
1977 10 07.11					23.0	R	12				0.08	295	OME
1977 10 07.11		8.1	A		23.0	R	12				0.37	40	OME
1977 10 07.19		8.0	A		20.0	L	10	40	5.0				SPR
1977 10 07.76	*	8.3	V		6.3	R		30	& 7	3/	0.07	170	USV
1977 10 07.78		8.0	V		6.3	R		30	& 8	3			JUH
1977 10 08.06		8.0			13.0	R		20					MAL
1977 10 08.74		8.1	X		12.0	L		50	12	2			MEZ
1977 10 08.75		8.0	V		10.0	L		50	&10	4			TUB
1977 10 08.77		8.1	V		6.3	R		30	& 6	4/	0.07	185	USV
1977 10 08.77		8.1	S		10.0	B		14	4				LAU
1977 10 08.79		8.1			12.5	L		60	&12.5	2	0.33	317	SZO
1977 10 09.74		8.0	X		20.0	L		60	& 3.5	2			PAP02
1977 10 09.75		8.0	X		12.0	L		50	12	2			MEZ
1977 10 09.75		7.8	X		15.0	L		50	7.6	6/			KAR01
1977 10 10.1		7.5	S		15.2	L	8	32	3	5			KRO02
1977 10 11.0	*	8.10	E		24.1	R	15		& 4	5			SAB
1977 10 11.05		8.1	S		15.2	L	8	65		1	0.25	290	STE01
1977 10 11.76		6.5:		S	15.5	L	7	33	5	3	0.33	40	FUL
1977 10 11.80		8.3	S		10.0	B		14	4				LAU
1977 10 12.72		8.0			20.0	L		60	3	2			PAP02
1977 10 12.77	*	7.1	S	S	8.0	B		20	5	4	0.17	44	CAV
1977 10 12.80		8.4	S		10.0	B		14	4				LAU
1977 10 13.01		8.3	S		20.3	R		70		1			STE01
1977 10 13.05		7.0	S		7.6	R							OME
1977 10 13.05					23.0	R	12	100			0.08	273	OME
1977 10 13.05					23.0	R	12	100			0.30	350	OME
1977 10 13.05					23.0	R	12	100	12		0.25	53	OME
1977 10 13.1		7.9	S		15.2	L	8	32					KRO02
1977 10 13.76		7.0	V		15.0	L		50	8.4	4			KAR01
1977 10 15.01		8.5	S		6.0	R	8	30		3			BEN01

Comet Kohler (1977 XIV = 1977m) Cont.

DATE (UT)	MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1977 10 15.74	7.6	V		8.0	B		10	5	4/			FEN
1977 10 15.78	7.8	V		6.3	R		30	& 8	5/	0.07		USV
1977 10 16.0	7.4	S		15.2	L	8	32	3	6			KRO02
1977 10 16.01	7.1	A		5.0	B		10					OME
1977 10 16.04	8.5	S		5.0	R		6					MIL
1977 10 16.06	7.4	O		8.0	B		11					COL
1977 10 16.07	7.7			13.0	R		20					MAL
1977 10 16.72	7.9	V		8.0	B		10	5	5	0.25	75	FEN
1977 10 16.80	8.5	S		10.0	B		14	4				LAU
1977 10 17.05	7.7			13.0	R		20					MAL
1977 10 17.06	7.3	S		8.0	B		20		5	&0.21	45	KRO02
1977 10 17.80	8.1	S		10.0	B		14	4				LAU
1977 10 18.03	8.1	S		11.0	R	10	26		3			BEN01
1977 10 18.05	7.4	S		8.0	B		20	4	6			KRO02
1977 10 18.06	8.4	S		15.2	L	8	65		1			STE01
1977 10 18.08	7.6			13.0	R		20					MAL
1977 10 18.80	7.9	S		10.0	B		14	4				LAU
1977 10 19.07	7.1			3.5	B		7					MAL
1977 10 19.13	7.5	A		8.0	B		11					COL
1977 10 19.77 *	6.7	S	S	8.0	B		20	5	3/	0.17	44	CAV
1977 10 20.06	7.0			3.5	B		7					MAL
1977 10 21.08	7.0			3.5	B		7					MAL
1977 10 21.13	7.4	A		8.0	B		11					COL
1977 10 21.79	7.3	S		10.0	B		14	4				LAU
1977 10 24.05				23.0	R	12	100	6.5		0.25	65	OME
1977 10 24.05				23.0	R	12	100			0.13	10	OME
1977 10 24.05				23.0	R	12	100			0.05	300	OME
1977 10 24.05	7.2	S		7.6	R							OME
1977 10 24.11				20.3	L	4	40	2.5				COL
1977 10 25.98				23.0	R	12	100			0.08	278	OME
1977 10 25.98	7.3	S		7.6	R							OME
1977 10 25.98				23.0	R	12	100			0.13	0	OME
1977 10 25.98				23.0	R	12	100	6		0.20	60	OME
1977 10 27.03	6.7	S		8.0	B		20	5	6/			KRO02
1977 10 29.02	7.8	S		15.2	L	4	49	& 2.7	1			MCE
1977 10 29.03				23.0	R	12	100			0.08	290	OME
1977 10 29.03				23.0	R	12	100			0.50	0	OME
1977 10 29.03				23.0	R	12	100	7		0.33	60	OME
1977 10 29.03	6.9	S		7.6	R							OME
1977 10 29.98	7.2	S		5.0	R		6					MIL
1977 10 30.02				23.0	R	12	100				300	OME
1977 10 30.02				23.0	R	12	100				30	OME
1977 10 30.02				23.0	R	12	100				350	OME
1977 10 30.02	6.7	S		7.6	R							OME
1977 10 30.02				23.0	R	12	100	7		0.50	70	OME
1977 10 30.06	6.8			3.5	B		7					MAL
1977 10 30.1	6.6	S		8.0	B		20		5			KRO02
1977 10 31.0	7.7	E		24.1	R	15		& 8	3			SAB
1977 10 31.01	7.0	S		8.2	R	9	28		3			KRO
1977 10 31.02				23.0	R	12				0.08	300	OME
1977 10 31.02				23.0	R	12		7		1	70	OME
1977 10 31.02	6.7	S		7.6	R							OME
1977 10 31.02				23.0	R	12				0.50	30	OME
1977 10 31.10	6.5	A		8.0	B		11					COL

Comet Kohler (1977 XIV = 1977m) Cont.

DATE (UT)		MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1977 10 31.13	*	7.2	S		15.2	L		48	12	2/			ROB
1977 11 01.04		6.8			3.5	B		7					MAL
1977 11 01.73					15.5	L	7	33			0.08	35	FUL
1977 11 01.73		6.1:		S	15.5	L	7	33	6	5	0.33	50	FUL
1977 11 01.76	*	6.3	S	S	8.0	B		20	7	3/	0.70	35	CAV
1977 11 03.00		6.9	S		3.5	B		7		2			STE01
1977 11 03.07		6.8			3.5	B		7					MAL
1977 11 05.07		6.7			3.5	B		7					MAL
1977 11 06.09					20.3	L	4	40	3.5		0.23	75	COL
1977 11 07.06		6.8			3.5	B		7					MAL
1977 11 07.77		7.3			10.0	B		14	10				LAU
1977 11 08.73		6.5:		S	15.5	L	7	33	8	5	0.50	55	FUL
1977 11 09.03		6.8			3.5	B		7					MAL
1977 11 10.03		6.8			3.5	B		7					MAL
1977 11 10.75		6.5			10.0	B		14			1		LAU
1977 11 11.01		6.7	S		7.6	R							OME
1977 11 11.01					23.0	R	12	100			0.08	300	OME
1977 11 11.01					23.0	R	12	100	7		1	70	OME
1977 11 11.01					23.0	R	12	100			0.50	0	OME
1977 11 11.04		6.8			3.5	B		7					MAL
1977 11 12.03		6.8			3.5	B		7					MAL
1977 11 12.13					20.3	L	4	40	3		0.25	80	COL
1977 11 12.13		6.4	O		8.0	B		11					COL
1977 11 13.0		6.8	S		8.0	B		20	5.5	6			KRO02
1977 11 13.03		6.8			3.5	B		7					MAL
1977 11 14.02		6.9	S		8.0	B		20	5.5	6			KRO02
1977 11 14.03		6.8			3.5	B		7					MAL
1977 11 14.73		6.6:		S	15.5	L	6	33	8		0.50	45	FUL
1977 11 16.75	*	6.3	S	S	8.0	B		20	5	3	0.33	24	CAV
1977 11 19.73	*	6.5	S	S	8.0	B		20	5	3	0.17	2	CAV
1977 11 22.0					15.2	L	8	32	3.5				KRO02
1977 11 22.0		6.9	S		8.0	B		20		5			KRO02
1977 11 26.03		7.1			3.5	B		7					MAL
1977 11 27.04		7.2			3.5	B		7					MAL
1977 11 27.72	*	6.7	S	S	8.0	B		20	5		0.17	0	CAV
1977 11 28.04		7.2			3.5	B		7					MAL
1977 12 01.03		7.1			3.5	B		7					MAL
1977 12 01.10		7.3	A		8.0	B		11					COL
1977 12 02.03		7.2			3.5	B		7					MAL
1977 12 03.04		7.1			3.5	B		7					MAL
1977 12 03.48		7.3	S		20.3	L							BOE
1977 12 04.04		7.2			3.5	B		7					MAL
1977 12 04.11					20.3	L	4	40	3.5				COL
1977 12 04.11		6.8	A		8.0	B		11					COL
1977 12 04.49		7.3	S		20.3	L			8		&0.04		BOE
1977 12 04.72	*	7.0	S	S	8.0	B		20	5	2	0.17	3	CAV
1977 12 06.04		7.3			3.5	B		7					MAL
1977 12 06.49		7.6	S		20.3	L					0.07		BOE
1977 12 07.04		7.5			13.0	R		20					MAL
1977 12 07.49		7.6	S		20.3	L					0.07		BOE
1977 12 08.49		7.6	S		20.3	L							BOE
1977 12 11.04		7.7			13.0	R		20					MAL
1977 12 18.05		8.0			13.0	R		20					MAL
1977 12 21.04		8.3			13.0	R		20					MAL

Comet Kohler (1977 XIV = 1977m) Cont.

DATE (UT)	MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1977 12 22.04	8.4			13.0	R		20					MAL
1977 12 27.46	8.6	S		20.3	L			5				BOE
1977 12 30.52	9.0	S		20.3	L							BOE
1977 12 31.49	9.0	S		20.3	L			4				BOE
1978 01 02.47	8.8	S		20.3	L							BOE
1978 01 08.06	9.3			13.0	R		20					MAL
1978 01 11.48	9.1	S		20.3	L			8				BOE
1978 01 30.46				20.3	L			6				BOE

Comet Bradfield (1978 VII = 1978c)

DATE (UT)	MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1978 03 02.77	5.8			5.0	B		7			0.06		PAR
1978 03 04.77	5.6			5.0	B		7				240	PAR
1978 03 06.77	5	:X		3.0	B		8		5	0.33	202	THO
1978 03 22.18 *	5.0	S		8.0	B		20	2	5/		327	CAV
1978 03 25.18 *	5.2	S		8.0	B		20	2	5/			CAV

Comet Seargent (1978 XV = 1978m)

DATE (UT)	MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1978 10 10.76	7.4			5.0	B		7	4.7				PAR

Comet Meier (1978 XXI = 1978f)

DATE (UT)	MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1978 05 03.24	9.5	A	S	20.0	L	10	40	2.0				SPR
1978 05 17.23	9.8	A	S	20.0	L	10	40	2.0				SPR
1978 05 18.23	9.8	A	S	20.0	L	10	40	2.0				SPR
1978 05 24.25	10.0	A	S	20.0	L	10	40	2.0				SPR
1978 05 27.13	9.5	S		20.3	R				1			STE01
1978 07 01.13 *	8.5	S		23.0	R	15	150	& 7	5			SAB
1978 07 01.18	9.2	S		40.6	L	8	160	0.33	4		200	LIN
1978 07 06.15 *	8.5:			23.0	R			& 5	3			SAB

Comet Meier (1979 IX = 1979i)

DATE (UT)	MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1979 10 12.20	12.0	A	S	20.0	L	10	125	& 1.0	1			SPR
1979 10 16.22	11.8	A	S	20.0	L	10	125	& 1.5	1			SPR
1979 10 23.24	12.0	A	S	20.0	L	10	125	& 1.25	1			SPR

Comet Bradfield (1979 X = 1979l)

DATE (UT)	MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1980 01 29.10	4.8	A	S	15.0	L	4	22	20.0	5			SPR
1980 02 02.11	6.0	A	S	15.0	L	4	22	15.0	5			SPR
1980 02 03.11	6.5	A	S	15.0	L	4	22	15.0	5			SPR
1980 02 04.13	7.5	A	S	15.0	L	4	22	10.0	5			SPR
1980 02 16.12	9.0	A	S	15.0	L	4	22	8.0	5			SPR
1980 02 20.14	9.5	A	S	20.0	L	10	40	4.0	4			SPR
1980 02 21.14	9.6	A	S	20.0	L	10	40	3.0	3			SPR
1980 02 22.13	9.8	A	S	20.0	L	10	40	3.0	2			SPR
1980 02 23.15	9.7	A	S	20.0	L	10	125	2.0	2			SPR
1980 02 29.15	10.0	A	S	20.0	L	10	125	2.0	2			SPR

Comet Meier (1980q)

DATE (UT)	MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1980 11 16.06	10.2	A	S	15.0	R		31	3				MOR03
1980 11 25.98	9.7	A	S	15.0	R		31	5				MOR03
1980 12 05.97	9.7	A	S	15.0	R		31	4.5				MOR03
1981 02 02.85	8.5	S		20.3	L		38	6	4			BOE
1981 02 05.44	9.6	A	S	15.0	R		31	5				MOR03
1981 02 06.86	8.6	S		20.3	L		38	6	4			BOE
1981 02 07.86	8.6	S		20.3	L		38	5	4			BOE
1981 02 08.85	8.7	S		20.3	L		38	5	3			BOE
1981 02 13.85	8.9	S		20.3	L		38	4	3			BOE
1981 02 14.23	11.1			26.0	L			1.1				MER
1981 02 14.83	8.9	S		20.3	L		38	4	3			BOE
1981 02 15.85	8.9	S		20.3	L		38	5	3			BOE
1981 02 27.44	9.9:	A	S	15.0	R		31	5				MOR03
1981 03 02.81	9.2	S		20.3	L		38	6	4			BOE
1981 03 03.87	9.2	S		20.3	L		38	6	4			BOE
1981 03 04.78	9.2	S		20.3	L		38	6	4			BOE
1981 03 05.79	9.3	S		20.3	L		38	6	4			BOE
1981 03 06.41	9.8	A	S	15.0	R		31	4.5				MOR03
1981 03 07.83	9.3	S		20.3	L		38	6	4			BOE
1981 03 08.80	9.3	S		20.3	L		38	6	3			BOE
1981 03 10.49	9.4	S	S	25.0	L	4	36	6	2			MAC
1981 03 11.79	9.4	S		20.3	L		38	5	3			BOE
1981 03 14.38	9.9	A	S	15.0	R		31	4.5				MOR03
1981 03 15.39	10.0	A	S	15.0	R		31	4				MOR03
1981 03 15.81	9.5	S		20.3	L		38	5	3			BOE
1981 03 16.83	9.5	I		20.3	L		38	5	3			BOE
1981 03 29.65	9.8	I		20.3	L		38	5	2			BOE
1981 03 30.69	9.8	I		20.3	L		38	5	2			BOE
1981 04 04.25	11.0	A	S	20.0	L	10	65	2.0	2			SPR
1981 04 05.29	9.3	S	S	25.0	L	4	36	7	2			MAC
1981 04 06.24	10.9	A	S	25.0	L	5	76	3.0	2			SPR
1981 04 07.26	11.4	A	S	32.0	L	7	144	2.0	2			SPR
1981 04 23.11	10.4	A		25.0	L	7	70	& 4	0/			MOR
1981 05 08.16	10.7	A		25.0	L	7	70	& 4	0			MOR

Comet Bradfield (1980t)

DATE (UT)	MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1981 01 08.98	5.4	A	S	3.5	B		7			1.5		MOR03
1981 01 10.98	5.5	A	S	3.5	B		7			0.4		MOR03
1981 01 10.98				6.0	R		36	2		0.3		MOR03
1981 01 11.97	5.7	A	S	3.5	B		7			0.6		MOR03
1981 01 11.98				6.0	R		36	2		0.35		MOR03
1981 01 14.71	5.6			15.0	L	6	22	2	7		30	MIL02
1981 01 15.73	5.6			15.0	L	6	22	2	7		30	MIL02
1981 01 16.73	5.6			15.0	L	6	22	2	7	0.16	30	MIL02
1981 01 17.97				6.0	R		36	1.4		0.17		MOR03
1981 01 17.97	6.4	A	S	3.5	B		7					MOR03
1981 01 20.72	6.5			15.0	L	6	22	2	6	0.07	30	MIL02
1981 01 21.73	6.7			15.0	L	6	22	& 1.5	6			MIL02
1981 01 22.73	6.8			15.0	L	6	22	& 1.5	5			MIL02
1981 01 23.73	7.2			15.0	L	6	22	1	6			MIL02
1981 01 29.99	7.9	A	S	6.0	R		36	3				MOR03
1981 01 30.99	7.8	A	S	6.0	R		36	3				MOR03
1981 02 03.99	7.9	A	S	15.0	R		31	3				MOR03

Comet Panther (1980u)

DATE (UT)	MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1981 01 09.00	9.4	A	S	15.0	R		31	4.5				MOR03
1981 01 10.46	9.1	A	S	15.0	R		31	3				MOR03
1981 01 29.43	8.9:	A	S	15.0	R		31	3				MOR03
1981 01 30.44	8.9	A	S	15.0	R		31	3				MOR03
1981 02 03.46	8.9	A	S	15.0	R		31	3				MOR03
1981 02 04.00	8.9	A	S	15.0	R		31	4				MOR03
1981 02 04.90	9.0	I	S	20.3	L		38	2	4			BOE
1981 02 05.44	8.8	A	S	15.0	R		31	3				MOR03
1981 02 06.17	8.4	Q		7.0	R		36	4	3			FUL
1981 02 06.90	8.9	I	S	20.3	L		38	3	5			BOE
1981 02 11.76	8.4			26.0	L			3.7				MER
1981 02 14.88	8.5	S	S	20.3	L		38	5	6			BOE
1981 02 15.88	8.4	S	S	20.3	L		38	5	6		35	BOE
1981 02 16.88	8.3	S	S	20.3	L		38	5	6			BOE
1981 02 25.98	8.6	Q		7.0	R		22	5	1			FUL
1981 02 26.86	8.5	Q		7.0	R		22	4	1			FUL
1981 02 27.35	8.6	A	S	15.0	R		31	5				MOR03
1981 02 28.08	8.5	A	S	15.0	R		31	4.5				MOR03
1981 03 02.85	8.2	S	S	20.3	L		38	5	6	0.08		BOE
1981 03 06.40	8.6	A	S	15.0	R		31	4				MOR03
1981 03 07.85	8.5	Q		7.0	R		22	4	1			FUL
1981 03 08.83	8.3	S	S	20.3	L		38	6	5			BOE
1981 03 10.03	9.0	N	S	15.0	R		31	4				MOR03
1981 03 10.41	8.3	A	S	25.0	L	4	36	6	5	0.13		MAC
1981 03 10.82	8.3	S	S	20.3	L		38	5	6	0.08		BOE
1981 03 12.35	9.0	N	M	15.0	R		31					MOR03
1981 03 12.35	9.0	N	S	15.0	R		31	4.5				MOR03
1981 03 12.88	8.4	S	S	20.3	L		38	5	6	0.08		BOE
1981 03 13.83	8.4	S	S	20.3	L		38	6	6	&0.08		BOE
1981 03 14.17	8.6	Q		7.0	R		22	3	1			FUL
1981 03 14.39	9.1	N	S	15.0	R		31	4				MOR03
1981 03 15.40	9.2	N	S	15.0	R		31	4				MOR03
1981 03 20.82	8.3			15.0	L							MER
1981 03 22.49	8.5	S	S	20.3	L		38	6	6			BOE
1981 03 27.86	8.6	Q		7.0	R		22	3	1			FUL
1981 04 04.84	9.4	A	S	10.8	L	4	15					KRA01
1981 04 05.22	8.6	S	S	25.0	L	4	36	5	7			MAC
1981 04 06.00	9.3	A	S	10.8	L	4	15					KRA01
1981 04 06.20	9.0	A	S	25.0	L	5	38	3.0	6			SPR
1981 04 07.19	9.3	A	S	25.0	L	5	38	3.0	5			SPR
1981 04 12.25	9.6	A	S	20.0	L	10	40	2.0	4			SPR
1981 04 13.19	9.8	A	S	20.0	L	10	40	1.75	4			SPR
1981 04 14.23	10.1	A	S	25.0	L	5	76	1.5	4			SPR
1981 04 15.20	10.3	A	S	25.0	L	5	76	1.5	3			SPR
1981 04 16.86	8.9			26.0	L	6	63					MER
1981 04 17.19	10.2	A	S	25.0	L	5	76	1.5	4			SPR
1981 04 18.21	10.4	A	S	32.0	L	7	76	1.25	4			SPR
1981 04 19.21	10.6	A	S	20.0	L	10	65	1.0	3			SPR
1981 04 21.89	8.7			26.0	L	6	63	3.1				MER
1981 04 23.13	9.5	A	M	25.0	L	7	70	& 2	4/			MOR
1981 04 28.07	9.5	A		32.0	L	6	55	2.5	4	?	45	BOR
1981 05 01.09	9.7	A		32.0	L	6	55	2.2	4/	?	45	BOR
1981 05 03.10	9.6	A	S	25.0	L	7	70					MOR
1981 05 03.10	9.6	A	M	25.0	L	7	70	3.0	3/			MOR

Comet Panther (1980u) Cont.

DATE (UT)	MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1981 05 04.10	9.5	A		32.0	L	6	55	5.4	4			BOR
1981 05 05.24	10.5	A	S	25.0	L	5	76	1.25	3			SPR
1981 05 08.08	9.8	A		32.0	L	6	55	3.9	4			BOR
1981 05 08.10	9.8	A	S	25.0	L	7	70	2.9	3			MOR
1981 05 08.10	9.8	A	M	25.0	L	7	70	.				MOR
1981 05 08.22	10.9	A	S	32.0	L	7	76	1.0	3			SPR
1981 05 16.22	10.7	A	S	20.0	L	10	125	& 0.75	3			SPR
1981 05 22.24	10.8	A	S	20.0	L	10	125	0.75	2			SPR
1981 05 24.10	10.3	A		32.0	L	6	55	2.7	2			BOR
1981 06 03.10	10.4	N	S	15.0	L	4	48	& 3	1			MOR

Comet Bowell (1980b)

DATE (UT)	MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1981 04 21.86	11.1			26.0	L	6	130	1.0				MER
1981 05 01.08	11.5	A		32.0	L	6	88	1.0	3			BOR
1981 05 04.08	11.5	A		32.0	L	6	88	1.0	3			BOR
1981 05 08.09	11.5	A		32.0	L	6	88	1.1	4			BOR
1981 05 08.18	11.7	A		25.0	L	7	70	1	3			MOR
1981 05 22.25	11.8	A	S	20.0	L	10	125	0.5	2			SPR
1981 05 24.10	11.5	A		32.0	L	6	88	1.1	3			BOR
1981 05 31.27	11.9	A	S	20.0	L	10	125	0.5	2			SPR
1981 06 02.13	11.6	A		25.0	L	7	140	1.2	3			MOR
1981 06 03.11	11.6	A		25.0	L	7	140	1	4			MOR
1981 06 06.28	11.7	A	S	25.0	L	5	76	0.5	3			SPR
1981 06 08.11	11.6	A	S	25.0	L	7	140	1	3			MOR
1981 06 13.29	11.9	A	S	25.0	L	5	76	0.5	3			SPR

Periodic Comet Encke

DATE (UT)	MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1977 07 22.33	9.2:			5.0	B		20	2	1			MAT02
1980 10 27.20	8.5	A	S	25.0	L	5	76	& 3.0	3			SPR
1980 10 29.20	8.0	A	S	25.0	L	5	76	4.0	3			SPR

Periodic Comet Grigg-Skjellerup (1977 VI = 1977b)

DATE (UT)	MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1977 03 19.48	12.8	V		32.0	L							JON
1977 04 02.72	12.0	V		32.0	L							JON
1977 04 09.36	9	:S		23.0	R	12	150		5	0.08	175	OME
1977 04 09.4	9	:S		23.0	R	12				0.03		OME
1977 04 12.85				20.3	L			& 3.5				BOE
1977 04 14.71	11.4	V		32.0	L							JON
1977 04 15.34	10.2	A		10.8	L	8	40	& 2.5	2			MAT02
1977 04 15.36	9.9	A	S	32.0	L	6	55	& 3.5	2			BOR
1977 04 15.85				20.3	L			& 4.5				BOE
1977 04 16.35 *	9.2	A	S	5.0	B		10	& 7				BOR
1977 04 16.35	9.9	A	S	32.0	L	6	55	4.5	2			BOR
1977 04 17.34	9.7	A	S	32.0	L	6	55	5.2	1	?	45	BOR
1977 04 17.34 *				5.0	B		10	& 6				BOR
1977 04 17.82				20.3	L			6				BOE
1977 04 18.10	9.7	X		10.8	L		36	4				DIE
1977 04 18.35	9.7	A	S	32.0	L	6	55	& 3.5	2	?	45	BOR

Periodic Comet Grigg-Skjellerup (1977 VI = 1977b) Cont.

DATE (UT)	MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1977 04 18.83				20.3	L			& 6.5				BOE
1977 04 19.09	9.8	X		10.8	L		36	3				DIE
1977 04 19.36 *	9.8	A	S	32.0	L	6	55	3.5	2	?	45	BOR
1977 04 19.81				20.3	L			& 6.5				BOE
1977 04 20.09	10.0	X		10.8	L		36	2				DIE
1977 04 20.36 *	8.9	A	S	5.0	B		10	6				BOR
1977 04 20.36 *	9.7	A	S	32.0	L	6	55	3.2	2			BOR
1977 04 20.74	11.7	V		32.0	L							JON
1977 04 20.85				20.3	L			& 7				BOE
1977 04 24.09	10.4	X		10.8	L		36	2				DIE
1977 04 28.08	10.6	X		10.8	L		36	4				DIE
1977 04 29.08	10.6	X		10.8	L		36	3				DIE
1977 04 29.35 *	9.6	A	S	32.0	L	6	55	3.9	1/			BOR
1977 04 30.08	10.8	X		10.8	L		36					DIE
1977 04 30.34 *	9.8	A	S	32.0	L	6	55	3	2			BOR
1977 04 30.34 *	9.1	A	S	5.0	B		10					BOR
1977 05 12.27 *	11.0	A	S	35.0	L	6	55	& 2.3	2			BOR
1977 05 13.31	11.0	A	S	32.0	L	6	55	& 2.7	1			BOR
1977 05 14.33	11.0:	A	S	32.0	L	6	55	& 3	0			BOR

Periodic Comet Haneda-Campos (1978 XX = 1978j)

DATE (UT)	MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1978 09 08.63	9.5			20.0	L		56	2.4	2/			PAR

Periodic Comet Borrelly (1980i)

DATE (UT)	MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1981 01 02.98	10.7	A	S	15.0	R		31	2				MOR03
1981 01 08.99	10.6	A	S	15.0	R		31	5				MOR03
1981 01 30.01	9.8:	A	S	15.0	R		31	3				MOR03
1981 01 31.00	9.5	A	S	15.0	R		31	4				MOR03
1981 02 04.01	9.8	A	S	15.0	R		31	3				MOR03
1981 02 07.04	9.6	A	S	15.0	R		31	4				MOR03
1981 02 23.47	8.7	S		20.3	L		38	3	3			BOE
1981 02 24.47	8.8	S		20.3	L		38	3	3			BOE
1981 02 25.49	8.8	S		20.3	L		38	4	4			BOE
1981 02 26.49	9.0	S		20.3	L		38	5	4			BOE
1981 02 28.02	10.1	A	S	15.0	R		31	4				MOR03
1981 02 28.48	9.2	S		20.3	L		38	4	5			BOE
1981 03 22.48	11.3	I		20.3	L		38	5	3			BOE
1981 03 23.50	11.3	I		20.3	L		38	4	3			BOE
1981 03 24.47	11.4	I		20.3	L		38	& 3.5	3			BOE
1981 03 28.08	10.4	A	S	15.0	R		31	3				MOR03
1981 03 28.48	11.6	I		20.3	L		38	4	3			BOE
1981 03 29.46	11.7	I		20.3	L		38	5	3			BOE
1981 04 05.17	10.6	S	S	25.0	L	4	36	2	4			MAC
1981 04 06.17	10.8	A	S	25.0	L	5	76	1.0	3			SPR
1981 04 07.18	11.2	A	S	32.0	L	7	76	1.0	3			SPR
1981 04 21.83	11.6			26.0	L	6	63	1.3				MER
1981 04 22.04	11.0	A	S	25.0	L	7	70	3.0	3			MOR
1981 04 23.06	10.8	A		25.0	L	7	70	2.2	3			MOR
1981 05 04.07	11.4	A	S	32.0	L	6	68	1.2	4			BOR
1981 05 08.07	11.4	A		32.0	L	6	88	1.6	0			BOR
1981 05 09.07	11.0	A		25.0	L	7	70	3	2			MOR

Periodic Comet Schwassmann-Wachmann 2 (1979k)

DATE (UT)		MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1981 01 03.13		12.1	A	S	15.0	R		62	0.8				MOR03
1981 02 05.24		13.1	A	S	15.0	R		62	0.8				MOR03
1981 02 20.18		11.9	A		25.0	L	5	121	1.0	3			SPR
1981 03 08.19		12.0	A		32.0	L	7	143	1.0	3			SPR
1981 03 18.19		12.3	A		32.0	L	7	143	0.75	4			SPR
1981 03 26.20		12.5	A		32.0	L	7	143	0.75	3			SPR

Periodic Comet Wild 2 (1978 XI = 1978b)

DATE (UT)		MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1978 02 04.31		11.8	A		20.3	L		40					COL
1978 02 13.06		11.3	A		23.0	R	12	120					OME
1978 03 21.06	*	11.4	A		23.0	R	12	200		7			OME
1978 03 23.07	*	11.4	A		23.0	R	12	250	& 2				OME
1978 03 31.06	*	11.3	A		23.0	R	12	250			0.05	90	OME
1978 04 01.06	*	11.1	A		23.0	R	12	250	2.5		0.05	90	OME
1978 04 03.08	*	11.0	A		23.0	R	12	250			0.05	40	OME
1978 04 03.08	*				23.0	R	12	250			0.04	110	OME

Periodic Comet Ashbrook-Jackson (1978 XIV = 1977g)

DATE (UT)		MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1978 10 02.76					20.3	L			& 3				BOE
1978 10 22.51					20.3	L			5				BOE

Periodic Comet Tuttle (1980h)

DATE (UT)		MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1980 09 24.20		11.5	A	S	15.0	L	4	22	2.0	3			SPR
1980 09 25.21		11.0	A	S	20.0	L	10	65	2.0	3			SPR
1980 09 26.20		10.0	A	S	15.0	L	4	22	2.0	3			SPR

Periodic Comet Chernykh (1978 IV = 1977l)

DATE (UT)		MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1977 09 11.16		12.5	A	S	32.0	L	6	88	0.7	4			BOR
1977 09 12.14	*	12.7	A	S	32.0	L	6	88	0.7	4			BOR
1977 09 15.33	*	12.7	A	S	32.0	L	6	88	0.5	3			BOR
1977 10 05.14		12.6	A	S	32.0	L	6	88	0.6	2			BOR
1977 10 05.50		13 :			20.3	L							BOE
1977 10 09.52		13.0			20.3	L			2				BOE
1977 10 13.06		12.9	A	S	32.0	L	6	88	0.5	4			BOR
1977 10 13.50		13.0			20.3	L			2				BOE
1977 10 31.01		12.7	A	S	32.0	L	6	88	0.9	2/			BOR
1977 11 03.65		13.0			20.3	L							BOE

Periodic Comet Schwassmann-Wachmann 1 (1974 II)

DATE (UT)		MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1979 02 22.80		12.0	V		30.0	L	3	100	1.5				TUB
1981 04 01.08		[13.0	A		32.0	L	6	110					BOR
1981 04 03.09		[13.0	A		32.0	L	6	110					BOR
1981 04 07.06		[13.0	A		32.0	L	6	110					BOR
1981 04 08.09		[13.0	A		32.0	L	6	110					BOR

Periodic Comet Schwassmann-Wachmann 1 (1974 II) Cont.

DATE (UT)	MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1981 04 22.85	10.3			26.0	L			0.8				MER
1981 05 01.06	11.5	A		32.0	L	6	68	1.2	3			BOR
1981 05 04.08	11.4	A		32.0	L	6	68	1.5	1			BOR
1981 05 08.07	11.5	A		32.0	L	6	68	2.5	1			BOR
1981 05 24.09				32.0	L	6	68	> 3.0	0			BOR

Periodic Comet Stephan-Oterma (1980g)

DATE (UT)	MAG.	R	MM	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1980 10 13.41	11.1	A	S	15.0	R		31	2				MOR03
1980 10 15.36	11.2	A	S	15.0	R		31	3				MOR03
1980 11 02.32	9.9	A	S	15.0	R		31	4				MOR03
1980 11 15.35	9.4	A	S	15.0	R		31	4				MOR03
1980 11 16.26	9.2	A	S	15.0	R		31	4				MOR03
1980 11 26.10	9.1	A	S	15.0	R		31	3				MOR03
1980 12 05.07	8.9	A	S	15.0	R		31	3				MOR03
1980 12 06.14	8.8	A	S	15.0	R		31	4				MOR03
1981 01 03.02	9.8	A	S	15.0	R		31	3				MOR03
1981 01 09.02	10.2:	A	S	15.0	R		31	3				MOR03
1981 01 12.07	9.7	S		15.2	L			& 2	3	0.02	75	KRO02
1981 01 13.17	9.9	S		15.2	L			& 2.5	5			KRO02
1981 01 14.13	10.1	S		15.2	L			& 1.5	5			KRO02
1981 01 23.04	10.5:	S		15.2	L				3			KRO02
1981 01 25.17	10.1:	S		15.2	L			& 1	3			KRO02
1981 03 02.05	12.2	A	S	32.0	L	6	68	1.2	0			BOR

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A REVIEW OF VISUAL COMET OBSERVING TECHNIQUES -- III

Charles S. Morris
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ABSTRACT. In the third part of this three-part paper, visual observations of the inner coma are discussed.

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INNER COMA OBSERVATIONS.

In the last few years, Drs. F. L. Whipple and Z. Sekanina have used accurate visual observations of detail in the inner coma to determine such physical characteristics of comets as the rotation period and axis orientation of cometary nuclei. Sekanina has been able even to map the locations of active emission areas on the nucleus of comet Swift-Tuttle. Most of the observations utilized in these studies were made a hundred years ago by careful observers who faithfully recorded the details of the inner coma in drawings. It has only been through the efforts of Whipple and Sekanina that the full usefulness of such observations has been revealed.

Unlike the other types of visual observations, detail of the inner coma is best observed with long focus, large-aperture instruments. To obtain accurate dimensions and position angles of jets, hoods, multiple nuclei, etc., it is preferred that the instrument be equipped with a filar micrometer or similar apparatus.

The saying, "A picture is worth

A REVIEW OF VISUAL COMET OBSERVING TECHNIQUES -- III

a thousand words," is a bit overused, but is nonetheless true. It particularly applies in the case of inner coma observations. Although the observer should strive to obtain as much quantitative data as possible, such as dimensions of jets and position angles, it is also extremely important to relate the overall appearance of the inner coma to the researcher. This is where a drawing is invaluable; it also provides a direct check on the quantitative data given with the observation.

Prior to going to the telescope, the observer should prepare a sketch showing the field stars around the comet's predicted position. This will assure that the features observed will be correctly oriented relative to the field stars. The scale of the drawing must be sufficient to allow small scale features to be recorded. Background field stars can be obtained from a number of atlases, including the AAVSO Variable Star Atlas, the SAO Atlas, or one of the Becvar Atlases (e.g., Atlas Eclipticalis). For fainter comets, it may be necessary to use a photographic atlas to obtain the necessary field stars.

The drawing itself is usually a negative image of the comet. That is, the comet and field stars are represented as black objects against a white background sky. Using a soft pencil, the details of the comet can be accurately portrayed by smudging and erasing the image to obtain the proper shadings and detail. The final drawing should include the comet's name and designation, the U.T. decimal date recorded to hundredths of a day, and the orientation and scale of the field. Additional notes concerning the observation, including instrument specifications, observing conditions, and a written description of the features in the drawing--including quantitative data (e.g., position angles, etc.)--should be attached to the drawing.

The procedures described above apply not only to drawings of the inner coma, but to all comet drawings. Some observers have included both large- and small-scale comet features on a single drawing by using different magnifications and/or instruments. Such efforts can produce rewarding results.

SUMMARY.

This three-part paper has reviewed the techniques of visual comet observing and the potential use of such observations to the professional astronomer. Any visual observer who has observed, or plans to observe, comets should remember two important points. First, the usefulness of the observations to the professional depends upon the accuracy with which they are made. The quality of any observation is solely dependent upon the observer. Second, experience counts. One cannot expect to be considered a reliable observer if one only observes the brighter comets which grace our skies every few years. In the past year there have been ten comets--P/Encke, P/Tuttle 1980h, P/Stephan-Oterma 1980g, Meier 1980q, Panther 1980u, Bradfield 1980t, P/Borrelly 1980i, P/Schwassmann-Wachmann 2 1979k, and Bowell 1980b--which have been observed visually with small- to moderate-sized (e.g., 25-cm reflectors) instruments from the northern hemisphere. (How many did you observe?) Observations made by those individuals with regular observing programs for both bright and faint comets will no doubt receive greater attention from the professional.

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REQUEST FROM THE EDITORS: We again ask for all visual cometary observations of comets made from 1976 to date. We plan to publish an extensive list of comet West 1976 VI (= 1975n) observations during the next year.

NARROWBAND FILTERS FOR COMETARY PHOTOMETRY

Michael F. A'Hearn
Astronomy Program, University of Maryland

The Working Group on Standardized Filters for Cometary Photometry, established by IAU Commission 15 at the last IAU General Assembly, is announcing the availability of standard filter sets. [EDITOR'S NOTE: Dr. A'Hearn notes that, although the vast majority of these filter sets will be used by professional astronomers, qualified amateurs with photoelectric equipment will be considered.] The filters are designed to isolate the emission bands of CN, C_3, and C_2 as well as two continuum points (see table below). These interference filters are of relatively narrow bandpass and are intended only for use in photoelectric filter photometry; they are not of imaging quality. Photometry with these filters can be used to study variations in the chemical abundances in the comae of comets. An example of the work that has been done with similar sets of filters is a recent paper by the author and Millis (1980). This paper summarizes the photometric results on more than a dozen recent comets and points out the correlations (or lack thereof) among the abundances, the heliocentric distances, the gas-to-dust ratio, etc.

The filter sets have been purchased with a grant from the U.S. National Science Foundation and will be distributed worldwide, beginning this summer, both by sale and by long-term loan, depending on the circumstances of the user. The purchase price of the sets is $335. per set, and the proceeds of these sales will be used to finance some of the calibration and distribution costs, as well as to purchase additional filters (one for CO^+ and one for a red continuum point) to be added to the sets next year. The working group will also distribute to all users of the filters a set of recommendations regarding the techniques of cometary photometry, a list of standard stars which is being established by the working group using these filters (B. Zellner and W. Wisniewski), and calibration information regarding the individual filters supplied to each user.

Photoelectric photometrists interested in obtaining a set of these filters should contact the author (Astronomy Program, University of Maryland, College Park, MD 20742), who is the chairman of the Working Group, giving some details of their proposed use (what telescopes, how many comets, etc.). Further details regarding the filters will be provided on request. Filter sets will be provided during the summer or at any later date, as orders are received.

REFERENCE

A'Hearn, M. F., and R. L. Millis (1980). A.J. 85, 1528ff.

TABLE I. FILTER CHARACTERISTICS

Physical size: 1-inch diameter, ≤ 3/8 inch thick
Blocking: to 1 micron
Design: 3 or 4 cavity
Manufacturer: Micro Coatings, Inc., Burlington, Massachusetts

Species	Central Wavelength	Bandwidth
Continuum	365.0 nm	10.0 nm
CN	387.0 nm	5.0 nm
C_3	406.0 nm	7.0 nm
Continuum	485.0 nm	10.0 nm
C_2	512.5 nm	12.5 nm

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FOR QUICKER DELIVERY, readers are again advised not to include "INTERNATIONAL COMET QUARTERLY" anywhere in the Editorial address (i.e., to Cambridge, MA).

AN EPHEMERIS FOR PERIODIC COMET SCHWASSMANN-WACHMANN 1

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

Following is an ephemeris to aid observers in locating P/comet Schwassmann-Wachmann 1 for the monitoring of outbursts. Thirty-eight astrometric observations from 1979 December 17 to 1981 April 25 were used to obtain the following elements, which were obtained by including perturbations by all nine major planets. The mean residual was 1.881 arcsec.

Epoch: 1982 March 12.0 ET = JD 2445040.5
Orbital elements (equinox 1950.0):
T = 1974 November 26.1922996 = JD 2442377.69230

ω = 48°.5478243	i = 9°.3621662	q = 5.773673013 AU
Ω = 312.3285907	e = 0.045503886	P = 14.877 years

Date ET	R. A. (1950)	Decl.	Delta	r	Elong.
1981 06 25	10 15.07	+06 15.2	6.745	6.308	60°.6
1981 07 15	10 25.61	+05 14.0			
1981 08 04	10 37.75	+03 59.3	7.183	6.312	28.7
1981 10 13	11 23.90	-01 22.4	7.187	6.317	27.3
1981 10 23	11 29.96	-02 09.9			
1981 11 02	11 35.65	-02 56.3	6.998	6.318	43.7
1981 11 12	11 40.87	-03 40.9			
1981 11 22	11 45.55	-04 23.0	6.741	6.320	60.9
1981 12 02	11 49.57	-05 02.1			
1981 12 12	11 52.84	-05 37.5	6.436	6.321	78.9
1981 12 22	11 55.28	-06 08.3			
1982 01 01	11 56.79	-06 34.0	6.111	6.322	97.9
1982 01 11	11 57.33	-06 53.8			
1982 01 21	11 56.86	-07 07.3	5.803	6.322	117.8
1982 01 26	11 56.25	-07 11.5			
1982 01 31	11 55.40	-07 13.9	5.666	6.323	128.2
1982 02 05	11 54.31	-07 14.6			
1982 02 10	11 53.00	-07 13.6	5.548	6.323	138.7
1982 02 15	11 51.48	-07 11.0			
1982 02 20	11 49.79	-07 06.6	5.453	6.323	149.2
1982 02 25	11 47.93	-07 00.8			
1982 03 02	11 45.95	-06 53.4	5.385	6.323	159.6
1982 03 07	11 43.87	-06 44.9			
1982 03 12	11 41.73	-06 35.1	5.346	6.324	168.9
1982 03 17	11 39.55	-06 24.5			
1982 03 22	11 37.38	-06 13.1	5.337	6.324	171.4
1982 03 27	11 35.24	-06 01.2			
1982 04 01	11 33.18	-05 49.0	5.359	6.324	163.6
1982 04 06	11 31.22	-05 36.8			
1982 04 11	11 29.40	-05 24.7	5.411	6.324	153.6
1982 04 16	11 27.74	-05 13.0			
1982 04 21	11 26.26	-05 01.9	5.489	6.324	143.4
1982 04 26	11 24.98	-04 51.5			
1982 05 01	11 23.91	-04 42.0	5.592	6.324	133.2
1982 05 06	11 23.08	-04 33.7			
1982 05 11	11 22.48	-04 26.5	5.714	6.324	123.3
1982 05 16	11 22.13	-04 20.6			
1982 05 21	11 22.01	-04 16.0	5.851	6.324	113.6
1982 05 31	11 22.52	-04 11.1			