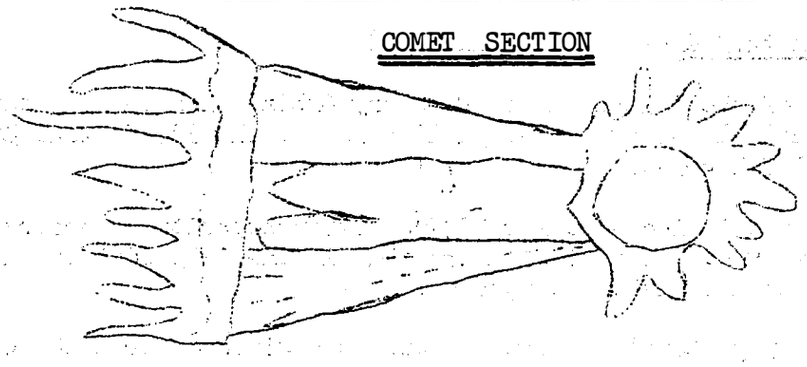
THE BRITISH ASTRONOMICAL ASSOCIATION

COMET SECTION



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FROM THE DIRECTOR

I am aware that there has been a lack of reporting of recent comet activity in the last two editions of the Bulletin, something I hope we can redress in Bulletin 12. This is partly due to the lack of good comets, especially in the northern hemisphere, but observations continue to come in on all comets within reach of our members' telescopes.

In this Bulletin I have again thought it necessary to take up space in explaining the search for a means of getting our observations published. The best observations are of little use if they are hidden to those who are interested in them. I am pleased to say that we now see the way to making publication possible and for future reference I have written a separate article. I hope that by the time we publish Bulletin 12 the new arrangements will be operating and I shall be able to clarify any outstanding points. Briefly the 'International Comet Quarterly' is being expanded to allow the publication of all amateur physical observations and we shall be co-operating with them by providing copies of members' observations.

I have had a small but welcome response to my request for information and ideas on 'Equipment and Techniques'. Graham Keitch has contributed a very useful paper on 'Instruments for Comet Work' and our thanks are due to him and to our other contributors to this issue.

MICHAEL J. HENDRIE

NOTICES

George Alcock, M.B.E.

George Alcock was awarded an M.B.E. in the New Year Honours List. His special astronomical interests spread over several decades have been meteor observing, in the days when most work was done visually by amateurs and when there was no radar and little meteor photography; comet observing, especially searching for new comets, of which he has discovered four; and most recently his nova search program which has so far lead to the discovery of four novae.

We offer him our congratulations and hope that further important discoveries await him in the future.

Catalogue of Cometary Orbits (Third Edition)

A third edition of the 'Catalogue of Cometary Orbits' has been prepared and is again available as a special publication of the IAU Central Bureau for Astronomical Telegrams.

Orbital information is included for 1027 cometary apparitions observed up until the end of 1978. This is 63 more than in the 1975 edition, and other information has been revised and updated.

Copies of the 88 page Catalogue can be purchased directly from the CBAT at $4.00 (surface mail) or $6.00 by airmail; for more information see the IAUC 3321 (1979 Jan 30). If the Association's office obtains a supply of Catalogues for sale to members an announcement will be made in the BAA Circulars.

Receipt of the Comet Section Bulletin

Readers may have seen the notice in the Journal (1979 February p 110) pointing out that members of the Association who do not contribute to the work of a Section may still ask to receive Section publications on provision of stamped addressed envelopes.

All members of the Comet Section should now be aware that we can only continue to send copies of future Bulletins if stamped self-addressed envelopes have been sent to the Publication Assistant in advance. Please keep a check on the state of your SAE's as we are unable to send out reminders. The Bulletin is 21 cm. wide (A4 width) and at present we restrict the content to fall within the 7p second class postal rate. There is no charge for the Bulletin itself, we just do not, in common with other BAA Sections, receive funds for postage of Section publications.

PUBLICATION OF THE SECTION'S OBSERVATIONS - M.J. Hendrie

In Bulletin 9 I referred to the need to publish and make available to any investigator who needs them our descriptive and photometric observations of comets. For convenience I shall refer to these as 'physical' observations, making a clear distinction between these and observations of position or 'astrometric' observations.

Astrometric observations of the required accuracy are transmitted to Dr. Brian Marsden at the Central Bureau for Astronomical Telegrams (CBAT) in Cambridge, Mass. by Stan Milbourn and, after any immediate use, are filed in the computer system there which now combines astrometric observations of minor planets (formerly held at the Minor Planet Center in Cincinnati) and comets. Following the recent review of the IAU Circulars publication policy most of the non-urgent observations are now published monthly in the Minor Planet and Comet Circulars which are produced from the computer files. Both the IAU Circulars and the MPC Circulars are available from the CBAT by subscription.

Correspondence with Dr. Marsden over the past two years on the desirability of publishing our observations, including those I hold as the present Director which go back to 1948, confirmed that professional astronomers in the IAU do believe that these observations are of value and should be published and made widely available. We have, therefore, considered how this could be done. Within the BAA there are the Journal, Memoirs and Section Bulletins. Readers will have seen in the Notices in the 1979 February Journal, 'Directors, Sections and Reports', para. 2 that the Forward Look Committee recommends that the Association should not continue to accept unlimited Section Reports for the Journal which are of little interest to general readership. Clearly it would not be a good time to submit long lists of individual observations going back some thirty years. Note however that there is no intention to eliminate reports summarising useful scientific work of more limited appeal, nor to restrict the publication of papers on Section work that is also of wider interest.

You will also have noticed the more general trend towards greater use and wider circulation of Section Bulletins, partly as a means of disseminating information that would once have been published in the Journal, at lower cost. Memoirs are necessarily very expensive and difficult to justify in these days of very high printing costs. The drawback to using the Bulletin for publishing all physical observations is that it does not have a wide enough circulation and although we do send out some complimentary copies to colleagues around the world we are not able to compete with the circulation of the Journal or publications supported by professional establishments. (We have published detailed individual observations made by our observers for some comets, e.g. Comet Kohoutek 1973 XII.)

However, I am pleased to say that since Bulletin 9 developments have taken place which will go a long way towards solving the problem of the publication of our individual observations. The following letter explains this development more succinctly than I could so I am reproducing it in full:

Central Bureau for Astronomical Telegrams

INTERNATIONAL ASTRONOMICAL UNION

August 25th 1978

Dear Comet Observer/Coordinator,

You may be aware that the publication THE COMET QUARTERLY, formerly called THE COMET, has been, for the past five years, a newspaper-journal concentrating on the publication of amateur observations of comets and helpful observing aids in the form of articles, charts, etc. You may also be aware of the need for a central international "clearing-house" to publish in one place all the useful physical (i.e. other than astrometric) observational data of comets. Currently much of these data are published in many forms by many astronomical groups in individual countries throughout the world, and a large number of observations are never published at all; some of what is published is difficult for interested individuals to obtain.

The Editors of the COMET QUARTERLY, Daniel W.E. Green, Valparaiso University, and Dr. Thomas L. Rokoske, Appalachian State University, announce the addition to the staff of Charles S. Morris, of Harvard Massachusetts, a well-known comet observer. This three-man staff will work toward uniting the world's amateur comet observations, collecting and filing them with the aid of a computer and publishing them in a comprehensive manner in the journal, now to be called THE INTERNATIONAL COMET QUARTERLY.

Until now, the only truly international source for comet observations (both astrometric and photometric) has been the IAU CIRCULARS. Space has always been a constraint, however, and a recent change in the publication policy for the IAU CIRCULARS will probably mean that even less space for amateur observations will be available in the future. I propose to pass on to the ICQ Editors observations I receive, although some may still be used on the IAU CIRCULARS also.

The ICQ project is a non-profit one and is involved with no single group; it is independent, although it is sponsored by the Physics Department of Appalachian State University in Boone, North Carolina. The objective is to make the comet observations readily available internationally to any interested individuals and groups at as low a cost as possible.

I highly urge you to give your support to this project. It is a large undertaking, but with your help, the outcome should be very effective.

Yours sincerely,

BRIAN G. MARSDEN

Director of the Bureau

I have been in touch with Mr. Daniel Green since last year and have offered our wholehearted support for this large and valuable project. You may know that he has been giving very valuable assistance at the CBAT especially over the transfer of the Minor Planet Center data from Cincinnati

to Cambridge, and is well qualified to tackle this project.

Daniel Green explains in a recent letter that the three man team of Charles S. Morris, Dr. Thomas L. Rokoske and himself "are working towards the goal of effectively publishing any and all available photometric cometary observations in an international publication that is independent of any single organisation, and one that is readily available to any interested individuals and groups (amateur and professional). We are working on computerising all the available data, so that we can (1) publish large bulks or numbers of observations with 'relative' ease, and (2) eventually be able to produce given observations as needed by an astronomer doing work on given comets." Groups and individuals around the world have responded favourably to the proposals.

While the ICQ team will concentrate on current observations first, the intention is ultimately to go back and include such observations as those we have in the BAA Comet Section archives.

I am at present in correspondence with Daniel Green over the most effective form in which to pass on our observations and should have something to say on that in Bulletin 12. For each individual observation received by the ICQ a card will be punched which will include the following information:

(1) Comet's preliminary designation, (2) the date in UT to hundredths of a day, (3) the total visual magnitude, given to tenths of a magnitude, (4) reference source used for magnitude estimates, (5) aperture of instrument used in cm, (6) the focal ratio of the instrument, (7) the power, or magnification used in making the measurements, (8) the type of instrument (e.g. refractor, reflector, Cassegrainian, binoculars, etc.), (9) Coma diameter, in minutes of arc (to tenths of a unit), (10) degree of coma condensation (on scale 0 to 9), and (11) name of observer by a 3-letter code, with keys including name and address published periodically in the ICQ.

Material such as tail lengths etc. will be published in paragraph form at the front of the ICQ while data in (1) to (11) above will appear in the last section of the journal in tabular form.

The International Comet Quarterly is available to individuals by subscription at a cost of $5.00 per year (outside North America). Subscriptions should be sent to Daniel Green, 721 S. Elmwood Ave., Oak Park, IL 60304 U.S.A.

From the point of view of observers in the Comet Section of the BAA there will be no change in the method of reporting observations (but please note that the ICQ would like the focal ratio of the instrument, as this is thought to have some bearing on magnitude estimates). Under item (11) I shall provide the observers details and the ICQ will code them. Although the ICQ only require the UT to two places, where it is relevant I should like to retain the three places on the Report Forms, as while it may not be often that a comet changes much in a few minutes, it does allow the altitude, relation to moonrise, twilight etc. to be checked by anyone analysing the observation.

We shall not be sending copies of Report Forms to the ICQ but summaries giving the data they require in tabular form plus notes on tail information etc. We are at present agreeing a form that will satisfy their requirements and act as an intermediate summary for ourselves as a step towards analysing and publishing reports in the Journal or Bulletin on individual comets. In this way we hope to avoid duplication of effort.

The ICQ emphasises that it does not intend to compete with existing publications but rather to supplement them by conveniently making available all existing observational data. Clearly it would be pointless for us to publish all our individual observations in BAA publications but we may sometimes wish to do so with some of them. But the emphasis now should be towards papers and summary reports on comets physical activity as observed by our members.

In Bulletin 9 I mentioned ways in which we might reduce the future burden of handling past and future observations and providing a 'second copy' of each

Report Form for security reasons. On the question of handling all the work, the idea of setting up computer files for all the data is still attractive and could provide directly the data the ICQ need from us. It may be that we should have to accept that it is not practicable to include also all the varied descriptive material. The ICQ intend to publish this in narrative form. Over the past few months I have had very useful correspondence and discussion with Mr. Storm Dunlop of the Variable Star Section. They are on the point of going live in computerising the VSS records. They have many more observations than we, at least an order of magnitude greater, but less varied data which simplifies coding to some degree.

My own view at present is that we should get the system of summary tabulation and publication in the Journal and Bulletin with copy to the ICQ up and going first. In doing this we can always consider the implications of computerisation so that if we go that route, and logically I feel that it must come, we do not have to backtrack. Mechanising an existing system is much safer for those of limited resources than starting completely afresh. In Bulletin 12 I hope to publish a specimen copy of what we have provided to the ICQ as an illustration.

Finally I should like to point out that by co-operating with the ICQ in their new venture, the Director of the BAA Comet Section will at last be able to assure observers that, if their observations meet a high enough standard, they will appear in print along with those of other amateurs around the world, and they will also be held in the central computer files until an amateur or professional researcher needs to refer to them. I feel that this should go a long way towards encouraging us all to regular observing and the pursuit of ever higher standards of work.

INSTRUMENTS FOR COMET WORK - G.S. Keitch

It has been said that any form of optical aid can be used to observe comets. Even so, the choice of instrumentation will need to be considered carefully if results are to be secured as easily and effectively as possible. More than one instrument will be required to facilitate an adequate range of aperture and magnification and the observer will need to be selective when choosing an instrument for a particular observation. It is well known that the choice of aperture and magnification can have a profound effect on the results obtained. Unfortunately, there are no set rules to specify which aperture and magnification should be used for a particular comet and most observers probably rely on past experience for guidance. Sometimes the nature of the comet itself will determine which instrument has to be used. For instance, a really bright large comet may not be seen properly in anything other than a small binocular, whereas another may be so faint and small that anything less than a 30 cm telescope will fail to show it at all. In these circumstances, one has little choice in the matter. Otherwise, the type of work to be carried out will be a determining factor. There are basically two objectives to a visual comet observation. The first is to secure an estimate of the comet's apparent dimensions and magnitude and the second is to make a record of any structural features or detail which may be apparent. In the former instance, the full extent of the coma will need to be seen and this will necessitate the use of low magnification for most comets (but not all). A low magnification will concentrate as much light as is available into the smallest possible area and the increased surface brightness which can result should allow the image to be discerned more easily. The lowest useful magnification can be defined as that which gives rise to an exit pupil no greater than 8mm in diameter because this is believed to be the approximate size of the observer's pupil when properly dark adapted. An exit pupil of this size corresponds to a magnification of x19 with a 15 cm telescope. In practice I have found such a magnification to be of little use because the background sky becomes too bright. In fact, I have seldom found any enhancement of a cometary image with an exit pupil exceeding 5mm diameter apart from on the very finest of nights. Even then the comet needs to be very large and diffuse to justify the lowest possible magnification and in this situation, binoculars are often more effective. They can be recommended for use whenever really low magnifications are called for. 10 x 50 Bs are ideal for favourably placed comets brighter than 9^m and greater than 3' in extent although observers with poor skies will find observations more easy to secure with 6 cm to 8 cm

binoculars. A 4-5 mm exit pupil will probably give best results. My Japanese 15 x 80 B are very useful for comet work and are capable of showing quite faint comets. Comet Meier (1978f) was only a few degrees above the north east horizon on 1977 May 28.94 UT when the $10^{m}.2$ coma was glimpsed in this binocular without too much difficulty. My 10 x 50 B has also been used for numerous photometric observations. Binoculars should always be steadied by some sort of mounting and most will attach to a standard photographic tripod without too much difficulty. As far as detail is concerned, binoculars are useful to observe any large diffuse feature of sufficient total brightness. Tails and diffuse haloes may pass unnoticed in a larger instrument whilst a binocular may shown them clearly. As a result, it is worthwhile to attempt a binocular observation even if the changes of seeing something appear rather remote. Some observers using 15 and 20 cm telescopes reported difficulty in seeing Comet P/d'Arrest (1976e) towards the end of July 1976. A quick look through a small binocular would have revealed that the small and difficult nebulosity was in fact a vast diffuse cloud over $\frac{1}{2}^{o}$ in diameter with a total magnitude of 6! Conversely, P/Ashbrook-Jackson (1977g) was barely visible in my 20 cm F/4 spec at x35 recently but could be seen clearly at x79. An even higher magnification would have been preferable but would have necessitated the use of a tiny eyepiece. A conventional telescope of greater focal length would have been far more convenient in this situation. Without doubt a larger aperture would have shown the $11\frac{1}{2}^{m}$ comet more clearly and I have come to the conclusion that one should use the largest aperture available if the comet to be observed is small and faint. A 30 cm spec will certainly show small faint comets more clearly than a 20 cm spec providing all other considerations are equal. A large aperture might also make the difference between merely suspecting a feature and actually seeing it clearly whilst the fainter limiting magnitude should extend the number of positive observations that can be secured. The lowest useful magnification becomes higher with an increase in aperture but a 30 cm F/6 telescope will operate with a magnification of only x45 (6.6 mm exit pupil) providing a readily obtainable 40 mm focal length ocular is used. Today there are a number of good quality oculars of sufficient focal length to provide most conventional instruments with reasonably low magnifications when a small binocular might be inadequate. Short focus F/4 reflectors are not as essential as they are sometimes made out to be. It is true that long focus oculars tend to have smaller apparent fields of view unless they have been designed for use with a 50 cm draw tube but even for a comet-seeker, this presents no real problem. A 31.7 mm push fit 32 mm erfle with an apparent field of 60^{o} will provide a magnification of x30 when used with a standard 15 cm F/6.5 reflector. The real field will still be 2^{o} which is quite adequate for comet seeking. I have used a 15 cm and 20 cm F/4 spec in the past when portability was an essential consideration but did not find them beneficial in any other respect. This will not accord with the experiences of all other observers and the final choice of instrumentation will be determined by one's observing conditions and resources. In America, Charles Morris uses a 15 cm F/4 spec at x24 and x48 to observe faint comets but apparently the conditions at his site are far superior to those which we are likely to encounter in this Country. On the other hand, it is interesting to note that most of John Bortle's observations reported in this bulletin and in The Astronomer have been secured with either 10 x 50 B or a 32 cm F/5.6 spec. Occasionally he uses larger binoculars but presumably the 5 cm binocular and 32 cm spec are adequate for most comets and certainly he does not appear to use an assortment of instruments in between for routine work. John also uses the large instrument to observe bright comets and in doing so, detects features missed by less experienced and less well equipped observers. Faint nuclei and fine jets or tails are not easy objects for any telescope but observers using apertures in excess of 30 cm must have a distinct advantage over those using only 15 and 20 cm telescopes. I have sold my F/4 reflectors and am about to acquire a 30 cm F/5 semi-portable telescope. A sturdy altazimuth fork mount has been constructed by H.N. Irving and Son and utilises a couple of ex-government drives for slow motion manual control in altitude and azimuth. The telescope will be equipped with a 3 inch x 12 finder (5.8^{o} field) which should prove very useful when trying to locate the correct field in adverse conditions such as twilight or in moonlight. The instrument should give a gain of almost one magnitude over the 20 cm spec which could just cope with comets of mag. 11.5-12.0 in very good conditions. I also intend to use the instrument to observe brighter comets, some of which have nuclei which are still as faint as mag 13-14. For instance, both comet P/d'Arrest (1976e) and Kohler

(1977m) possessed a 13m nucleus whilst the total magnitude of the coma itself was about 7½ as seen in 10 x 50 B.

During 1978 I constructed an altazimuth 13 cm F/5 refractor as a portable comet-seeker to replace the 15 and 20 cm F/4 reflectors previously referred to. I had become dissatisfied with the short focus reflectors which frequently operated under rather poor skies. When employing the low magnifications necessary for seeking comets, the contrast was often so poor as to be intolerable so I decided to put together a short focus refractor. The absence of a large secondary obstruction, a more stable collimation and slightly greater focal ratio might help to improve definition and contrast especially if a coated object glass could be used. The 5 1/16 ins coated lens of 24¾ ins focal length supplied by the American firm A. Jaegers seemed ideal and was obtained for me by Bretmain Ltd. A 15.5 ins length of 5 in internal diameter brass tubing was obtained and I proceeded to polish the exterior until the desired finish has been obtained. Meanwhile, Irving provided an adjustable cell for the glass and a sturdy rack and pinion focusser both of which were designed to push fit over the ends of the brass tube. When the various components had been acquired the telescope was assembled in minutes. Irving also supplied ring and trunnions and a fork mount to fit an ex-government tripod which I obtained for 25p from a local surplus warehouse. The cost of the instrument was less than half of what one would expect to pay for a commercially made instrument of similar size and specification. When used with a University optics multi-coated 24 mm König eyepiece, the comet seeker has a magnification of x26 and a field of 2.6°. Unfortunately, I sometimes find that the 68° apparent field of this eyepiece is too large and I shall probably revert to a more standard orthoscopic giving a real field of 2°. Following our marriage in August of last year, Janice and I moved into our present home which is situated in a rural location far superior to that which I had been used to previously. The new 13 cm refractor shows the nebulosity south of Merope in the Pleiades without any difficulty whilst even the 20 cm spec enabled me to follow Comet P/Ashbrook Jackson (1977g) quite easily before that particular instrument was sold. As an added bonus, our new home is within walking distance of a small but densely wooded hill, the top of which provides a superb site for comet seeking. Although only 12 miles south of Bristol, the scenery in the area is very impressive and from the top of the hill one has a breathtaking view of countryside in all directions. From our back garden the sky is also more or less unobstructed all round as the only dwellings in the immediate vicinity are bungalows. The Mendip Hills to the south cause a 2 or 3° cut off as does our bungalow itself but this is of little significance. One day I hope to instal a facility similar to that used by John Bortle and Les Peltier for comet seeking.

Finally, optics of inferior quality can be used for comet work but results will be more easily obtained with an instrument of good quality when critical aspects of this work are being attempted. It is for this reason that I have replaced my old eyepieces with multi-coated Meade Research Grade orthoscopics and updated my equipment as described.

G.S. KEITCH 1979 Feb. 27th

THE OBSERVATION OF COMETARY TAILS AND HEADS

E.J. Crick, Dendermondestr. 48, 1880 Merchtem, Belgium.

The primary objective of photographic and visual observations is to record peculiarities of the comet structure. I will give now a classification system for tails and heads. This system was used during the 'International Year of the Quiet Sun': maybe it can be used in future by the BAA Comet Section.

Classification of Tails:

Type I Straight tails, extending along the prolongation of the radius vector; of irregular shape compounded of separate streamers and condensations.

Type II Strongly curved tails; near to their ends they break up into

cross stripes, synchrones directed towards the nucleus (terminal synchrones). Included in this type are also straight tails which consist of one synchrone beginning at the nucleus (complete synchrones). This is the type III tail according to Bredikhin-Orlov.

Type I is an ionised plasma tail while type II and III are dust tails. For the photography of the Type I tail we must use a blue sensitive plate and for types II and III we must use a panchromatic plate, because the tail of type I will show more distinctly in the U.V. and blue (because of the wavelengths of the CO bands) while tails of types II and III will be best shown in the yellow-red region.

Classification of Heads

Type E Bright comas, bordered on the side towards the Sun by envelopes of parabolic shape with the focus at the nucleus of the comet.

Type C The brightness of the head is, on the average, four times less than for Type E. In appearance it is like a germinated bulb.

Type N There is neither a coma nor an envelope. One or several tails of Type III set off from the bright star-like nucleus.

Type Q Weakly luminous conical projection in the direction of the Sun.

Type H The head is made up of expanding rings with the centre lying at the nucleus of the comet.

This system may at first seem a little complicated but is quite easy in practice. This type of classification is also very interesting for statistical studies.

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References

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N.B. Richter: 'Statistik und Physic der Kometen' J. Barth, Leipzig (1957) (See also the English translation 'The Nature of Comets' Methuen 1963)

Annals of the IQSY, vol. 1 Geophysical Measurements Techniques, M.I.T. (1968)

COMETS IN 1976 - S.W. Milbourn

1976a = 1976 IV. Bradfield. The indefatigable Bill Bradfield discovered his 5th comet on 1976 Feb 19.49 when he found a diffuse object without condensation moving SE in Fornax. He gave the magnitude as 9 but other observers shortly after discovery were reporting the magnitude as 10.

Preliminary elements showed that the comet was near perihelion (T = 1976 Feb 24) but as the earth-comet distance was decreasing, some brightening could be expected. Maximum magnitudes reported were around 8.5 at the end of February and early March but later fading occurred and by the end of March the magnitude was down to 10. By April 24 a photographic magnitude of 13 was recorded at Woolston. The comet remained uncondensed throughout the period of visibility and no tail was reported.

Elements by Dr. B.G. Marsden (IAUC 2942) based on observations from Feb. 21 to Apr. 4 showed that a parabolic solution was not satisfactory:

T	1976 Feb. 24.613 ET	ω	313°.003	
e	0.99375	Ω	160.094	1950.0
q	0.84781 AU	i	46.840	

1976b = 1977 V. P/Kopff. Recovered by Dr. E. Roemer and C.A. Heller on 1976 Feb. 25.3 using the 229cm reflector of the Steward Observatory at Kitt Peak. The images, of around mag. 20.5, were too weak to show cometary character but the position and motion was consistent with the predictions in the Handbook 1976 and on IAUC 2885. On 1977 Jun. 12, A.C. Gilmore (Mount John University Observatory) using a 61 cm Cassegrain

reflector recorded the nuclear magnitude as 15.0.

Originally discovered in 1906, P/Kopff was making its 11th recorded return, only the 1912 apparition having been missed.

1976c = 1975 II. Schuster. Discovered by Hans-Emil Schuster on 1976 Feb. 25.3 (confirming plates being obtained on March 3, 4 and 5) using the 100cm Schmidt telescope at the European Southern Observatory, La Silla. The comet, of magnitude 15, was moving slowly SW in Vela and had a fuzzy tail structure on the northern side of the image. Later observations were consistent in reporting the magnitude around 17 - 17.5 and as perihelion had been reached over a year earlier, no brightening could be expected. The perihelion distance of nearly 7 AU is the largest known to date and the comet being intrinsically bright was still under observation early in 1978 when over 9 A.U. from both Sun and Earth.

The following elements by Dr. B.G. Marsden are based on 32 observations 1976 Feb. 25 - May 2:

T 1975 Jan. 15.4925 ET	ω	193°.4371	
	Ω	22.0827	1950.0
q 6.882188 AU	i	112.0176	

1976d = 1976 V. Bradfield. Yet another discovery by Bill Bradfield came on 1976 March 3.8 when he found a 9th magnitude diffuse object with condensation, moving SE in the constellation Grus. The comet was past perihelion at the time of discovery and remained an inconspicuous object, fading to 11th magnitude by the end of March.

The following elements by Dr. B.G. Marsden satisfy 6 observations March 4 - March 10 within around 2" arc:

T 1976 Feb. 25.060 ET	ω	221.760	
	Ω	69.506	1950.0
q 0.67829 AU	i	147.772	

1976e = 1976 XI. P/d'Arrest. Recovered by Dr. E. Roemer and C.A. Heller on 1976 Feb. 25.5 using the 229cm reflector of the Steward Observatory at Kitt Peak. The image of the comet was very weak and of nuclear magnitude 21.5. By March 25 the comet had brightened by one magnitude and on May 28, the comet appeared sharp with a stellar necleus of magnitude 18 and with the barest trace of coma southward. Visually, the comet was at 12th magnitude at the end of June and during July brightened rapidly to reach magnitude 7 by the end of the month. The maximum magnitude of 5 was achieved during August, the apparent diameter being very large - almost 30' arc being reported during the first half of the month. A progressive fading occurred during September and by the end of October, the comet was down to 8th magnitude. The last visual observations appear to have been made in late December with the magnitude at 12.

Originally discovered in 1851, P/d'Arrest was making its 13th recorded appearance and the prediction in the Handbook 1976 required a small correction of ΔT = -0d.015.

1976f = 1976 XIV. P/Pons-Winnecke. Recovered by Dr. E. Roemer and C.A. Heller on 1976 March 25.2 close to the prediction in the Handbook 1976 (ΔT = +0d.01). The image, obtained with the 229cm reflector of the Steward Observatory at Kitt Peak, was weak and of approx. magnitude 21.0 (nuclear mag.) Originally discovered by Pons in 1819, the comet was lost until rediscovered by Winnecke in 1858. The present apparition is the 18th recorded return.

1976g = 1976 XIII. Harlan. Discovered by E.A. Harlan (Lick Observatory) on 1976 May 3.2 using the 51cm double astrograph, this comet appeared as a small diffuse object with strong condensation of magnitude 15, moving SW in Canes Venatici. A pre-discovery image was found by C.T. Kowal on a plate exposed on April 27.3 using the 46cm Schmidt telescope at Palomar.

Although perihelion was not until 1976 Nov. 3 at a distance of 1.57 AU, the comet did not approach the Earth within 2AU and remained a relatively faint object.

The following elements calculated by Dr. B.G. Marsden are based on 41

observations 1976 April 27 - October 25, perturbations by all nine planets being taken into account:

T	1976 Nov. 3.1501 ET		Epoch 1976 Oct. 9.0 ET
e	0.999695	ω	193°.3540
		Ω	80.7206 1950.0
q	1.568877 AU	i	38.8059

1976h = 1977 I. P/Johnson. Recovered by Dr. E. Roemer and C.A. Heller on 1976 May 5.3 using the Stewart Observatory's 229cm reflector at Kitt Peak, almost exactly in the predicted position given on IAUC 2911. The prediction in the Handbook required a correction of $\Delta T = -0d.1$.

The comet appeared as a small spot of approx. magnitude 20.5 (nuclear). P/Johnson was originally discovered in 1949 and was making its 5th recorded return.

1976i = 1977 IV. P/Faye. Recovered by Dr. E. Roemer and C.A. Heller on 1976 May 5.4 using the Steward Observatory's 229cm reflector at Kitt Peak. The comet appeared as a weak spot of approx. magnitude 20.0-20.2 (nuclear) and the position was in good agreement with the prediction in the Handbook 1976. The total magnitude was around 16 and the comet became bright enough to be observed visually during 1976 December - 1977 January when magnitudes around 12 were reported.

Discovered originally in 1843, P/Faye was making its 17th recorded appearance.

1976j = 1976 X. P/Klemola. Recovered by G. Sause using the O.H.P. Universite de Liege Schmidt telescope on 1976 Aug. 6.1, the comet being of integrated magnitude 12 and displaying a tail 2' - 3' long. On August 19, a plate exposed at Woolston showed a condensed coma 20" in diameter with a tail 1'5 long in p.a. 210°. Visual observations were made during September, magnitudes reported being between 11.5 and 12.

This was the first return of this periodic comet discovered in 1965 and the prediction in the Handbook 1976 required a correction of $\Delta T = -10d.2$

1976k = 1976 IX Lovas. Discovered by M. Lovas (Konkoly Observatory) on 1976 Oct. 27.1, a diffuse 17th magnitude object with condensation in the constellation Ursa Major. On 1976 Dec 27, exposures by Dr. E. Roemer and C.A. Heller using the Steward Observatory's 229cm reflector at Kitt Peak showed well condensed images and a suggestion of a tail to the SSW.

The comet which had a large perihelion distance of 5.8 AU remained a very faint object and the following elements have been calculated by Dr. B.G. Marsden using 26 observations 1976 November 22 - 1977 March 14, perturbations by all nine planets being taken into account:

T	1976 July 5.9415 ET		Epoch 1976 July 1.0 ET
e	1.004418	ω	118°.7503
		Ω	285.3330 1950.0
q	5.856959 AU	i	86.6351

EQUIPMENT AND METHODS

Letters to the Bulletin

"Over the years I have received from Kodak quite a lot of information on photographic materials etc. that may be of interest.

Firstly there is a manual entitled 'Kodak Plates and Films for Science and Industry' (ref. P-9). My 1970 edition cost 60p. It has 76 pages including 44 pages of data sheets. Astronomy is well covered with emphasis on low intensity objects.

Another one is Booklet SE-3 called 'Kodak Scientific Films and Plates' and again consists of data sheets. Mine is dated 1971.

Among my data sheets is one referring to 'Kodak Photomicrography Monochrome Film SO-410'. According to this sheet this is a film with 'extremely fine grain, extremely high resolving power, moderate speed and panchromatic response with enhanced red sensitivity', and is available in variable contrasts. So this could be a suitable comet film. The data sheet is P-304.

Another data sheet is P-210 'Special Red Sensitive Plates for Astronomy' which gives information on plates type 098-01 (without antihalation backing) and 098-02 (with antihalation backing). These have 'a moderate course, medium contrast, panchromatic emulsion with increased sensitivity in the red region of the spectrum.'

I do not know if anyone would be interested in using Infrared films black and white or colour; these might give interesting effects over the far red part of the spectrum. Two other films that might be of interest are 2475 and 2485 Recording Film about 3200 and 8000 ASA respectively, depending on what developer is used.

I do not know anything about Agfa films and plates. I believe that Polaroid film is quite fast, about 400 ASA and simple cameras can be built to use this type of film.

Over the last few years quite a number of new emulsions have been produced about which I have very little information at present. I hope the above notes will be of use to some readers and assist in obtaining current information sheets.

John C. Fairweather,

26 Avenall Road,
Highbury, London N5 1DP

****

Kodak special astronomical films types 103a-O, 103a-E and 103a-F can be obtained from Bretmain Ltd. (99 Hamilton Road, Felixstowe, Suffolk) At the time of writing (October 1978) prices are: 125ft roll 35mm film £37.95 each and 36 exposure 35mm rolls £3.50 each (minimum order 10 rolls).

Information provided by: Peter Madej,

Newsome Observatory,
16 St. Johns Avenue,
Huddersfield, HD4 6JP

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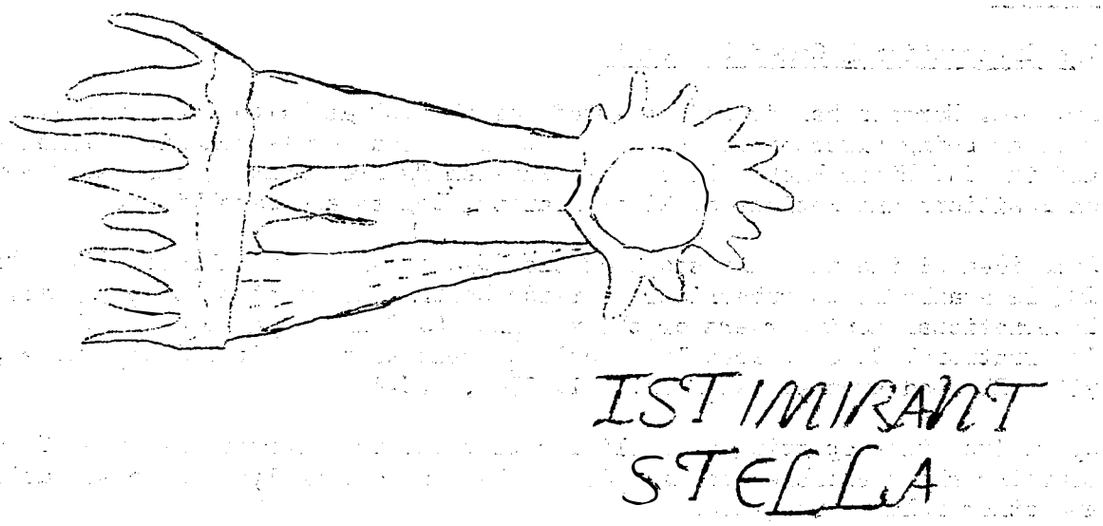
Note added in press: 1979 Feb. JBAA carries a Bretmain advert offering 36 exposure films as above at £3.75 per roll plus 20p pp.

THE BRITISH ASTRONOMICAL ASSOCIATION

COMET SECTION



BULLETIN NO. 12

SEPTEMBER 1979

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FROM THE DIRECTOR

Since Bulletin 11 in March comet activity has continued to be low, especially for comets bright enough for our members to observe. Only comets Bradfield 1979c, P/Schwassmann-Wachmann (3) 1979g and Meier 1979i have exceeded 12^m a little, and there have been no comets bright enough for observers with smaller instruments. Observations received have been very few. Reports on these comets will be held over until Bulletin 13.

Some of our members with larger visual and photographic equipment have been involved this year with searches for three possible photographic comet discoveries by BAA members, but in no case has the object been confirmed. Although these searches can take up a great deal of time they are necessary to ensure that no comet discoveries are overlooked, and observers do not mind the effort involved providing the 'discoverer' has taken all the usual precautions to eliminate as many spurious effects as possible. In all the cases this year there has been a real possibility of a discovery and every reason for the 'discoverer' to ask for help in obtaining confirmation. Independent confirmation is almost always essential before a discovery can be passed on to the worldwide network of the Central Bureau for Astronomical Telegrams. Not only is there considerable expense in circulating information, but astronomers' and instrumental time is involved too and more important work may be disrupted.

Graham Keitch has contributed another article, this time on binoculars. While I am very pleased to hear about his equipment and views, neither he nor I can believe that he is the only reader that has anything of interest to communicate about the instruments that they use or have used for comet work, and I should very much like to see articles by others on their telescopes and accessories. Perhaps his experiences with binoculars will bring some confirmation or disagreement from other readers of the Bulletin.

NOTICES

The International Comet Quarterly

Dr. B.G. Marsden has joined the staff of the ICQ as Editorial Adviser. As well as being Director of the IAU Central Bureau for Astronomical Telegrams and the IAU Minor Planet Center Dr. Marsden is President of the IAU Commission on Positions and Motions of Minor Planets, Comets and Satellites.

Some idea of the aims and scope of the ICQ was given in Bulletin 11. The ICQ is available to subscribers outside North America at $5.00 per year. International money orders or cheques in U.S. Dollars payable to 'The International Comet Quarterly' should be sent to the Editor Daniel Green, 721 S.Elmwood Avenue, Oak Park, Ill.60304, U.S.A.

Apart from the reporting of worldwide photometric observations, the ICQ also contains short articles on methods of observation, analyses of observations and other related subjects.

Comet News Service

Comet News Service is a quarterly review and irregular bulletin published by the McDonnell Planetarium, St. Louis, and Planetarium Friends and is circulated to U.S. and Canadian planetaria, libraries, science writers and astronomers. The Editor is Joseph N. Marcus (a visitor to the BAA in 1975).

Individuals outside North America may receive the publication by sending International Reply Coupons allowing two coupons per issue or an International money order in U.S. Dollars at the rate of $4.00 per six issues made payable to 'CNS/J.Marcus'; issues are sent by airmail (as with the ICQ). The subscription address is CNS c/o McDonnell Planetarium, 510 Clayton Road, St. Louis, MO 63110, U.S.A.

CNS contains very interesting short articles on observing methods, current developments in cometary research and reports on recent discoveries, recoveries and observations of comets.

BAA Exhibition Meeting - May 1980

The Comet Section has had no exhibition of its work at the last two or three Exhibition Meetings. Since Comet West in 1976 there has been very little in the way of drawings and photographs to show. However, other Sections show something; some observations about 40 years old were on show this year.

Perhaps we forget that older observations and ones made a few years ago are still of interest. Many visitors to the meeting have not seen them before; either they are new members or they do not get to many meetings. And if they are good examples of the Section's work they are worth seeing again by regular visitors to the Exhibition Meetings.

I should like to suggest that we try to stage a come-back in 1980, even if there are no bright comets before then. In addition to drawings and photographs of comets, light curves or analyses could be shown, but of particular interest next year (in the absence of spectacular comets) would be photographs and drawings of instruments (if not the instruments themselves) built for comet work. In the last few years a number of members have built or acquired telescopes, binoculars, cameras etc., specially for comet observation.

It is not too early to start preparing exhibits; by the next Bulletin (March/April 1980) the meeting will be only a matter of weeks away, so by raising the matter now I hope that I have forestalled complaints that there is not enough time!

(MJH)

Updating Observer's Records and Section Meeting

So as to update the records held by the Director and Publication Assistant I should be grateful if readers would complete and return the questionnaire forming the last two pages of this Bulletin. In Bulletin 13 I propose to list observers and their locations and main instruments. If anyone wishes to remain anonymous please place an X in the box provided!

The idea of a Comet Section Meeting is raised from time to time and it is many years since one took place. I feel that there is much that could usefully be discussed but with a widely scattered membership it is difficult to find an acceptable meeting place.

However, as a first step and to find out whether there would be much support for such a meeting would you please complete the section at the foot of the questionnaire. Should anyone have more specific ideas for a venue these could be considered. I think we should be thinking of the second half of 1980 or even 1981 and certainly not within the next six months or so.

(MJH)

BINOCULARS FOR THE COMET OBSERVER - G.S. Keitch

Following my contribution to the last issue of this Bulletin (Instruments for Comet work) I have received a number of requests for further information about binoculars for comet work. Binoculars have a number of uses in observational astronomy and my previous article gave details of their value for observing the brighter comets.

It is still possible to purchase a new 8x30, 7x50 or 10x50B for less than £20 and even at this price, the performance and quality is surprisingly good. About 2 years ago, I bought a Prinz 10x50B for about £14 and the same model is currently selling for £19 at a local store. They produced an image which, although not perfect, was nevertheless quite serviceable and they were particularly useful for obtaining photometric data for Comet Kohler (1977m) when it was brighter than about 8^m. Even so, the serious observer will appreciate the better image quality and contrast provided by a superior binocular and recently, I have been looking at various makes with a view to obtaining such an instrument. The comments which follow are based purely on my own findings and are not the result of any serious technical investigation. I have simply looked at a variety of binoculars and drawn my own conclusions about their quality and probable performance. The real test has got to be based on their performance when turned towards the night sky, but this could be done in only a few cases. I found only a few models in the cheap price bracket, i.e. under £25-£30, but there was a vast assortment in the £30-£80 range with little to choose between them optically. Models in the £80-£150 range appeared to be of a noticeably superior optical quality and it should not be necessary to pay in excess of this for a really good glass even though a few West German brands cost way over £200! Whilst considering expenditure, it is worth remembering that for serious observing, the binocular must be mounted firmly. I have found that a sturdy photographic tripod is ideal and it is helpful if the binocular has a central bar for the attachment of a tripod adaptor. Most models of the American design lack this but they do incorporate a threaded base on the underside of the binocular instead. Suitable tripods cost about £25-£50 whilst the tripod adaptor may add a further £4 or £5.

Most of the binoculars that I have looked at were in the middle price bracket and virtually all of them suffered from poor definition at the edges of the field of view. Very few possessed good image quality apart from at the very centre of the field and most suffered very poor definition beyond an apparent field of about 30^o. This was especially noticeable in models with simple Kelner-type eyepieces whilst those with Erfle-type oculars suffered less in this respect. The latter tended to yield apparent fields of about 70^o-80^o, of which about 40^o gave relatively good definition. Most binoculars seemed to be well corrected for chromatic aberration whilst field curvature was pronounced in some, but negligible in others. I did not encounter many with

undersized prisms although I expect that some can be faulted on this account. None of the middle price range binoculars appeared to use high quality optical components and in this respect there was little variation in standards. The quality of the anti-reflection coatings seemed dubious on one or two models, although I am not sure how significant this is. A few makes incorporated image enhancement filters or special coatings of a similar nature but these may be undesirable for astronomy. Pentax binoculars, for example, incorporate an interference filter.

The quality and design of the binocular body itself did vary roughly in accordance with price and some of the cheaper models did not defocus very smoothly or accurately. This would be an important consideration for comet photometry. Furthermore, the oculars on some of the cheapest models were supported on very feeble frames attached to the central focussing mechanism and would bend out of alignment with the slightest finger pressure! Cheaper models may also let in damp and the comet observer who is likely to be out in very cold or damp weather should ensure that a well sealed model is selected. It should not be necessary to obtain a proper marine 7x50B which should be designed with individually focussable eyepieces to provide a better seal against damp. Indeed, such a binocular might be very tedious to operate if it is to be defocussed for the purpose of estimating comet magnitudes using the Bobrovnikof method. On the other hand, there could be an advantage in this arrangement when using the Sidgwick In-Out method, as one half of the binocular could be left in focus whilst the other is defocussed. By opening and closing each eye alternately, one could make rapid comparisons between the focussed comet image and defocussed stars although I have not tried this technique. In any event, this can be achieved with central focussing models by simply defocussing the ocular which is independently adjustable without using the central focussing device. This technique can only be employed if both halves of the binocular are homogeneous as far as image quality is concerned, and this is not always so.

It is not possible to review individual models here, although the price ranges previously referred to can serve as a rough guide to quality and performance. Each individual will no doubt form his own opinions when trying out a binocular and there must always be some margin for personal preferences. A few models certainly represent better value for money. The Greenkat 8.5x50B with multicoated objectives (£65) was quite good but I was less impressed by the reputable Swift range. I did not try the Supreme Gold Riband models which are in the £100-£150 price bracket, although a friend advises me that these are noticeably superior, as indeed they should be at that price. The Swift 7x50B Storm King in that particular range is multicoated but has individual eyepiece focussing. The model I finally selected was the Zeiss multicoated 10x50 Jenoptem at £79. The optical quality of this model appears to be excellent. Definition at the field edges is very good and the advantages of multicoating are quite noticeable. For instance, when turned towards the moon, there is very little excess stray light which, in cheaper binoculars, sometimes creates all sorts of horrible effects. The multicoated 10x50s would have been most useful on the evening of 1977 Nov 15 when Comet Kohler was only $2\frac{1}{2}^{o}$ away from the crescent moon! It is certainly not uncommon for a bright star to be troublesome due to its close proximity to the comet and this situation is more likely to arise with fields of view in the order of 5^{o}-8^{o} as is usual with 10x50s. Light transmission and contrast are of great concern to the comet observer and multicoating is certainly a welcomed advancement for binoculars. The technique has been in use for some time on camera lenses and eyepieces, and I deliberately avoided acquiring a new binocular a year or two ago, as I anticipated that multicoating would soon be introduced for binoculars.

The final choice of binoculars will be determined, to a great extent, on the nature of the work to be carried out and also, whether one has access to any other instruments. A 15cm-30cm spec will show comets down to mag 11-12 in which case, a small binocular will be required for brighter comets only. If the observer does not have access to another instrument, then a larger binocular should be recommended to permit fainter visual coverage. Whilst comets as faint as 9^{m} can be seen in 10x50s, only those brighter than about $7\frac{1}{2}^{m}$-8^{m} will be seen clearly. Conversely, a 15x80B can show 9^{m} comets, quite clearly and can even reach 10^{m}-11^{m} in exceptional circumstances. Binoculars are most useful for observing the brighter comets, many of which have extended features

that would be over magnified in a large aperture instrument. In this respect 10x50s are ideal although observers with poor skies may prefer a 56, 60, 70 or 80mm binocular.. Magnifications resulting in an exit pupil of about 5mm are most suitable.

If comet sweeping is to be carried out with binoculars, apertures in excess of 80mm will be required although there have been instances when discoveries have made with the very smallest of binoculars. My 15x80B gives good coverage down to about 9^m and occasionally, objects as faint as 11^m are swept up. Even so, to be really competitive, objects of 10^m-11^m ought to be in easy reach of an instrument intended for comet sweeping and an aperture of 12-15cm is probably the minimum to satisfy this requirement consistently. In good conditions, and with care, one can definitely use a 15x80B for comet hunting although a 20x80B may resolve close groupings of stars more easily.

Models with wide angle oculars are not necessarily the best choice for comet seeking, despite their wider field of view, because the eyepieces provide poor eye relief. The close contact to the eye lens which this necessitates can cause discomfort as well as misting-up problems. The latter problem can be reduced by wrapping the instrument in a blanket to increase insulation although lens heaters are probably the best solution.

Large binoculars are extremely expensive although my 15x80s cost only £65 3½ years ago when I first ventured into astronomy. (It was Comet West that first got me interested.) The same model now costs about £120 and is one of a range made in Japan and sold in this Country under the name of Hilkinson. The others in the series are 20x80 and 30x80 although I doubt whether the latter will be of interest. The optical performance of the 15x80B (3.5° field) is really quite good although there is a slight trace of chromatic aberration and rather strong field curvature. Mechanically, there is room for improvement but they represent superb value for money and I can certainly recommend them for comet work. Recently, I have acquired a new Swift 20x80 observational binocular with wide angle eyepieces giving a field of 4°. This is an impressive instrument which looks as if it has been designed with the astronomer in mind. It incorporates dew caps which are absent on other models, although they can always be added as were those on my 15x80B. There is also a sensible central bar extending the entire length of the binocular to facilitate attachment to a tripod. The instrument appears to have good quality optics although it can be faulted on two accounts, both of which arise from the use of extremely wide angle oculars. Firstly, the apparent field of 80° simply provides a vast margin of astronomically unacceptable definition around the edge of the field and secondly, the Erfle-type oculars do cause some unwanted reflections around bright objects. These faults are almost certainly common to all models with wide angle oculars although the latter fault would be mostly eliminated with multicoating. The Swift 20x80B costs between £220 - £300 depending on whether it is acquired by mail order (Opticron Ltd.) or from a local camera shop. The same binocular is available at a slightly cheaper price under the brand name of Tohyoh. In America, University Optics sell an identical model if the pictures on P487-8 in Sky and Telescope May 1979 are anything to go by. University Optics also supply a cheaper 11x80 and 20x80 whilst in this Country Bretmain Ltd. offer a 12x80B (4.5°) for about £180. Celestron do an 11x80B which could be obtained from Charles Frank for about £190 a short while ago and this model should give excellent views of comet tails although an exit pupil size of 7.3mm might be a little wasteful in bright skies. The 11x80, 15x80 and 22x80 Beck Tordalk binoculars sell for about £400 and are regularly advertised in the BAA Journal by E. Marcus Ltd.

Military binoculars are a different matter altogether. Opticron supply a number of models in this class which would be superb for comet work but I believe the current prices are something like £600 for the 20x80B, £2,000 for the 20x120B and £6,000 for the 35x or 40x150B!! Bedford Astronomical Supplies produce a binocular telescope, the 1978 prices for which were about £1,000 for the 121mm model (x25-x100) and about £2,000 for the 50x151B. Giant binoculars from the Second World War are being used around the world for comet work, especially comet hunting. They are of various specifications, i.e. 25x105, 20x120, 25x125 and most originated from Japan or Germany. They are now in great demand and fetch between £500-£1,000. Only a few years ago, a couple of friends (Mr. A.P. Stephens and Mr. K.C. Thomason) both acquired Ross 10x80 binoculars for about £40 each but they now fetch about £150-£250 depending on their condition. Exchange and Mart regularly carries advertisements

for large binoculars. Some of the old military binoculars have inclined eyepieces which allow the observer to sit comfortably when viewing near the zenith. Otherwise, it can be very awkward when conducting a search of the sky above an altitude of about 60° with conventional binoculars unless a special observing chair has been constructed.

In actual fact, it is not impossible to build a large binocular. One possibility involves replacing the objectives in a small binocular with two much larger lenses such as those supplied in America by A. Jaegers. The 5 1/16" lense with a focal length of 24.75" as used in my short focus refractor (see last bulletin) is an excellent choice and several articles have appeared in Sky and Telescope in recent years describing instruments made in this way. One day I would like to build an identical refractor and fix the two side by side with several right angle prisms to bring the light paths to each eye.

Most good camera shops are able to supply the more common brands of binoculars and this is probably a good place to start if one is surveying the market for the first time. A few useful addresses are given for those wishing to search further afield.

Opticron: 400 Hatfield Rd., St. Albans, Herts, AL4 ODU (Mail Order)
Bretmain Ltd: 99B Hamilton Rd., Felixstowe, Suffolk.
Bedford Astro Supplies: 5B Old Bedford Rd., Luton, LU2 7NX.
E. Marcus Ltd., Moor House, 7 Moorfields, London, EC2Y 9AE and
46 Liverpool St., London, EC2M 7PR

(We invite readers to write to the Bulletin about their experiences with binoculars of different makes and types and about the telescopes they use, especially where these make use of unusual features intended for the observation of comets. MJH)

PUBLICATION OF THE SECTION'S OBSERVATIONS - M.J. Hendrie

The first batch of BAA Comet Section observations were sent to the ICQ Associate Editor Charles Morris in May. We shall be sending more observations shortly.

Reproduced below is part of one page which shows a sample of the information sent. The layout of this form has been agreed with the ICQ to facilitate entry into their computer files and also as a useful summary stage for our own analysis.

The definitions of the information entered into each column are given on pages 17 and 26 of the April 1979 ICQ but the essential details are reproduced below. It would be very helpful if observers would complete the Comet Section Report Forms in such a way that this information can be extracted easily. This does not require any major change from the instructions used by the Section (available from the Director if any reader does not already have them). But where an observer reports a magnitude observation on the same form as other data, e.g. tail length , and uses more than one magnification or even a different instrument (e.g. binoculars for the tail observation) it is important to indicate which power and instrument was used for which part of the observation. Many regular observers already do this by the use of small cross-reference letters against the instruments shown at the bottom of the form. Please note that the ICQ also require the focal ratio of the instrument for visual, as well as photographic observations, although this was not requested on the BAA instructions for completing the BAA Report Forms.

The use of the numerical scale for the degree of condensation of the head of the comet is also helpful and it is better for the observer to make this judgement rather than the person analysing the observations (see item 9 in the list below). By all means include a verbal description of the coma and condensation where this adds information that is not covered by the DC scale.

The twelve column headings on our summary forms and reports of observations listed in the ICQ may be explained as follows:-

(1) "Date (UT)" Time of observation of magnitude estimate in days and hundredths of a day. (Greater accuracy required for accurate and semi-accurate positions.)

(2) "MAG" The estimate is to tenths of a magnitude. A colon indicates an approximate value.

(3) "R" Source of magnitude estimates, e.g. 'S' is SAO catalogue. 'P' indicates photographic Mag.

(4) "AP" Aperture in cms used for magnitude estimate.

(5) "T" Type of instrument, L = reflector, R = refractor, B = binoculars, etc.

(6) "F/" Focal ratio of instrument used for magnitude estimate.

(7) "PWR" Magnification used for magnitude estimate.

(8) "COMA" Coma diameter in arcminutes to hundredths; '&' indicates approximate value.

(9) "DC" Degree of condensation of coma; 0 = extremely diffuse, 9 = stellar in appearance. A slash ('/') indicates midway between two numbers, e.g. '3/' = $3\frac{1}{2}$ or 3 to 4.

(10) "TAIL" Lengths in degrees to hundredths of a degree.

(11) "PA" Position angle of tail in degrees.

(12) "OBS" Observer code. First three letters of surname, followed by two-digits; e.g. observers names starting with HEN would be HEN 00, HEN 01, HEN 02, etc.

Example of part of form used to send observations to the ICQ, information extracted from BAA Comet Report Forms, slightly amended to illustrate codes.

DATE (UT)	MAG	R	AP	T	F/	PWR	COMA	DC	TAIL	PA	OBS
1978 05 03.94	9.1	S	26	L	-	80	1.5	3	-	-	HUR 00
1978 05 04.93	10.0	S	11.5	R	-	70	1.0	3/	-	-	RID 00
1978 05 09.89	10.0	S	20.3	L	4	83	0.8	5	-	-	KEI 00
1978 05 26.96	10.5	S	10.5	B	-	25	3 &	3	0.1	95	PAN 01

It is clearly a great help if observations are sent in to the Director promptly so that they can be entered in chronological order and sent to the ICQ.

COMETS IN 1977

1977a = 1977 II P/Taylor. Recovery of this short period comet, not seen since its discovery apparition in 1915/16, occurred on 1976 Dec. 13 and Dec. 14 when C. Kowal (Hale Observatories) identified images on plates taken with the 122cm Schmidt telescope at Palomar, the comet being diffuse with some condensation and of total magnitude 16.

Two components of the comet were observed in 1916 and the current recovery corresponds to the component B (which is believed to be the principal component), the correction to the prediction in the Handbook 1976 being ΔT = -1.4 days. Searches were made for component A without success.

1977b = 1977 VI P/Grigg-Skjellerup. Making its 13th appearance since the original discovery in 1902, P/Grigg-Skjellerup was recovered by P. Jekabsons (Perth Observatory) on 1977 Jan. 21.7 using the 33cm astrographic telescope. The comet was diffuse with condensation but without tail and of magnitude 18.

The recovery position was in close agreement with the prediction in the Handbook 1976 (ΔT = -0.014 days).

Visually the comet brightened to around magnitude 9 during late April 1977, later fading to magnitude 11 by mid-May.

1977c = 1976 XII Lovas. Discovered by M. Lovas (Konkoly) on 1977 Feb. 17.9 as a 15th magnitude diffuse object with condensation and a possible short tail, moving westward in Leo Minor. With perihelion at the end of October 1976, the comet faded and few observations were made.

The following hyperbolic elements by Dr. B.G. Marsden are based on 13 observations 1977 Feb. 27 - 1978 Feb. 4 (Catalogue of Cometary Orbits, Third Edition, 1979):

T	1976 Oct. 31.9849 E.T.	ω	146.2782	
e	1.003168	Ω	337.4708	1950.0
q	5.715012 AU	i	64.5217	

1977d. P/Tempel (2) Recovered by C-.Y. Shao and G. Schwartz on 1977 Mar. 27.2 using the 155cm reflector at the Harvard College Observatory's Agassiz Station. The comet, making its 16th appearance since discovery in 1873, was almost stellar in appearance, magnitude 19.5. The recovery position was in very close agreement with the prediction in the Handbook 1977.

1977e = 1977 VIII Helin. Discovered by E. Helin (California Institute of Technology) on 1977 Apr. 16.4 using the 46cm. Schmidt telescope at Palomar. The comet, of magnitude 15, was moving SW in Virgo and appeared diffuse with condensation with a short broad tail. Although brightening to magnitude 14 by late April, the comet moved well south and no observations appear to have been obtained after mid-May.

Parabolic elements were calculated by Dr. B.G. Marsden based on 30 observations Apr. 16 to May 15 (Catalogue of Cometary Orbits, Third Edition 1979):

T	1977 June 30.9729 E.T.	ω	249.3525	
		Ω	19.4429	1950.0
q	1.117568 AU	i	43.1893	

1977f = 1977 III P/Kowal. Discovered by C.T. Kowal (Hale Observatories) on 1977 Apr. 24.4 using the 122cm Schmidt telescope at Palomar. The comet, of magnitude 16 - 17, was diffuse with some condensation and with a tail 2' long to the NE. The comet was moving SW in Virgo.

The orbit was completely indeterminate from the early positions but later it became apparent that the orbit was of short period and the following elements by Dr. B.G. Marsden are based on 7 observations 1977 Apr. 24 - June 17 (Catalogue of Cometary Orbits, Third Edition, 1979):

T	1977 Feb. 22.5568 E.T.	Epoch 1977 Feb. 26.0 E.T.	
ω	178.0493	e	0.237034
Ω	28.4357 1950.0	a	6.112350 AU
i	4.3586	n^o	0.0652216
q	4.663515 AU	P	15.11 yrs

T is uncertain and there is an uncertainty of about 2 weeks in the period. By June 17, the comet had faded to 18th magnitude and no further observations appear to have been made.

1977g P/Ashbrook-Jackson. Making its 5th appearance since discovery in 1948, the short period comet was recovered by Z.M. Pereyra and H. Moyano (Cordoba) on 1977 Apr. 28.3 using the 154cm reflector at Bosque Alegre. The comet was diffuse with central condensation and of magnitude 19.5. The recovery position was in good agreement with the prediction in the Handbook 1977.

Although recovered in 1977, perihelion was not until August 1978 and by the middle of 1978 the comet was bright enough for visual observations with moderate sized telescopes. Magnitudes reported showed an increase in brightness from magnitude 12.9 at the beginning of July to 11.3 by the end of September later decreasing again to 11.8 by the end of October. During September a tail was observed which attained a length of some 10' arc.

1977h P/Whipple. The 7th appearance since discovery in 1933, P/Whipple was recovered by Z.M. Pereyra and J. Laborde (Cordoba) on 1977 May 26.3 using the 154cm reflector at Bosque Alegre. This confirmed an earlier tentative identification by C.- Y. Shao on a plate taken with the 155cm reflector at Agassiz on 1977 May 16.3. The comet was diffuse with central condensation and of magnitude 19.8. The recovery position was in good agreement with the prediction in the Handbook 1977.

1977i P/Tempel (1). Originally discovered in 1867, P/Tempel (1) was making its 6th appearance (having been lost between 1879 and 1966) when recovered by C.-Y. Shao on 1977 Apr. 12.1 using the 155cm reflector of the Harvard College Observatory's Agassiz Station. The image of the comet was very diffuse and faint at magnitude 20.4, the position being in very close agreement with the prediction in the Handbook 1977.

1977j P/Wolf-Harrington. Discovered by Wolf in 1924 and rediscovered by Harrington in 1951, this comet was making its 6th appearance when recovered by G. Schwartz on 1977 July 11.3 using the 155cm reflector at the Harvard College Observatory's Agassiz Station. The comet was well condensed, magnitude 19.5 and the recovery position in good agreement with the prediction in the Handbook 1977. Total magnitudes reported were 17.5 on July 23 (Seki) and 14 on 1978 Jan 3 (Furata).

(To be continued)

S.W. MILBOURN

OBSERVER'S RECORD reply form

So that we can update the Section's records of observers addresses, telephone numbers, instruments and observing conditions would you please complete this form and return it as soon as possible to the Director. The opportunity has been taken to ask some supplementary questions, most of which information is usually supplied by members joining the Section, so as to gain a better idea of the overall facilities available to each observer and his special interests.

1) SURNAME: ..... OTHER NAMES or INITIALS .....
and TITLE: .....
ADDRESS: ..... TELEPHONE NUMBER/S: (say when usually available)
....
....

2) MEMBERSHIP OF OTHER ASTRONOMICAL SOCIETIES (e.g. RAS, BIS, JAS, TA, Local)

.....
.....

3) ACTIVE MEMBERSHIP OF OTHER BAA SECTIONS (say which)

.....
.....

4) SPECIAL INTERESTS (e.g. comet seeking, photography, computing)

.....
.....

5) CIRCULARS received (BAA, IAU, TA, JAS, other)

.....
.....

6) CHARTS AND CATALOGUES available

.....
.....
.....
.....
.....

7) OBSERVING LOCATION/S (and approx. Latitude and longitude)

.....
.....
.....

8) INSTRUMENTS (owned or frequent access to, incl. binoculars)

Type Aperture F/ Focal Lgth. Usual Powers Mounting (Photo)Film used

.....
.....
.....
.....
.....

9) OTHER EQUIPMENT (e.g. plate measuring, photometer, cold camera, spectroscope, etc.)

.....

.....

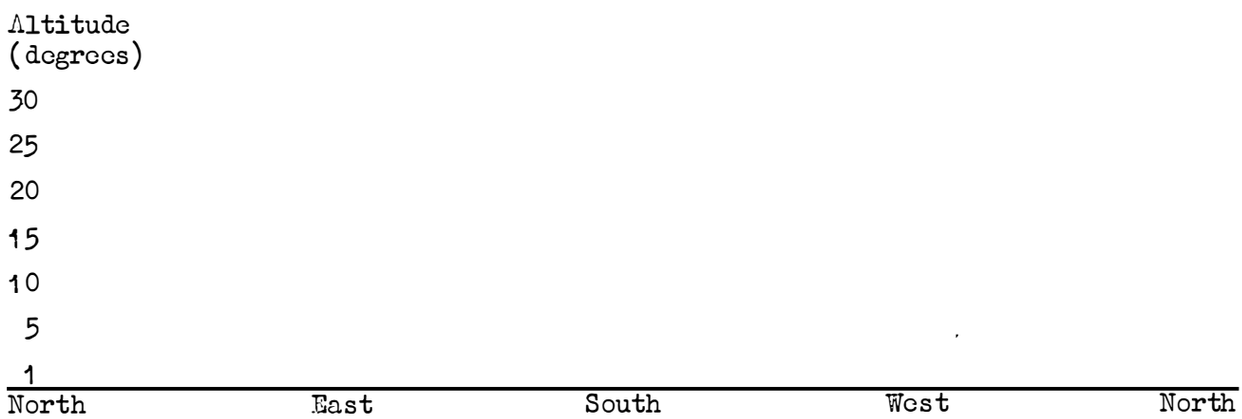
.....

.....

10) OBSERVING CONDITIONS

Please give information on general observing conditions, street lighting, skyline, smoke haze, etc. and best directions for observing. Use the outline diagram below to indicate skyline, interference from lights, etc.

Please indicate when you are most usually able to observe, evening, morning, all night and whether you can usually observe on clear nights.



Skyline, glow of town lights etc. from usual observing site

.....

11) ANY OTHER INFORMATION (please add here or on a separate sheet)

.....

.....

.....

.....

.....

(If you do not want to see any of this information published in the Section Bulletin place a cross here ☐

SECTION MEETING

As a preliminary feeler on the amount of interest there would be for a Section Meeting in 1980/81, please answer the following short questionnaire.

1) If a meeting were arranged would you be likely to attend if held (tick as many as apply):

a) on a weekday: (b) on a Saturday: c) within 50 miles of your home.

d) within 100 miles of your home: e) more than 100 miles from your home.

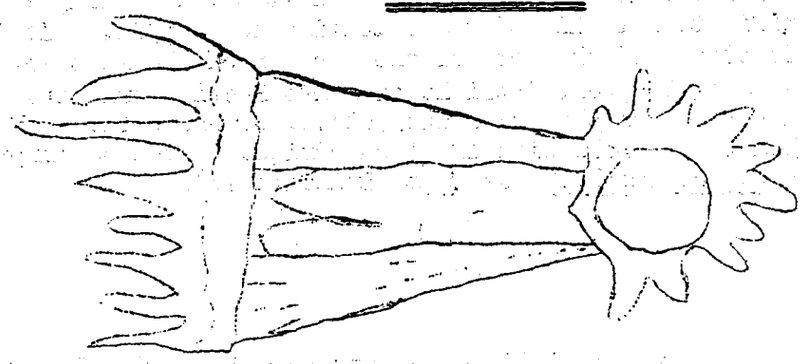
f) in London.

2) Preferred month, if any: .....

3) Any views on form meeting should take, comments, ideas, content:

THE BRITISH ASTRONOMICAL ASSOCIATION

COMET SECTION



BULLETIN NO. 13 — MARCH 1980

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FROM THE DIRECTOR

Since the publication of Bulletin 12 last September there have been some further observations of comet Meier 1979i but this comet was never brighter than 11^m. The discovery of comet Bradfield 1979l on Christmas Eve at 5^m promised some interesting observing but while the comet gave quite a good showing in the southern hemisphere it faded rather more quickly than expected and this, together with a period of very cloudy weather during the first two weeks of February, meant that most of us did not see the comet under good conditions until it was below 8^m. Reports of these two comets appear in this Bulletin.

Some 25 Observer's Record reply forms have been returned and this has been most helpful, but there must be quite a few regular observers who have not yet responded. I should be pleased to receive these completed or supply further forms if these have been mislaid.

Work is in hand on 3 Section Reports for publication in the Journal and more observations have been sent to the International Comet Quarterly. The ICQ has already published BAA observations for several comets along with those made in many other parts of the world.

Some of the points mentioned above are reported in more detail below. I wish to thank all those who have continued to support the work of the Section by sending in observations, writing for the Bulletin and in many other ways. It is difficult to feel the same degree of excitement about comet work when for several years there are no really bright and active comets, but as in other branches of astronomy it is the gradual accumulation of observational data that eventually brings results and observations of the less spectacular comets are in their way just as important, perhaps more so because fewer observers are likely to be making them. And a really bright comet might appear at any moment, so we need to be ready to make the most of it when it happens.

* * * * * * * * * * * * * * * * * * *

NOTICES

Exhibition Meeting - May 1980

The Association's Annual Exhibition Meeting will be held on Wednesday May 28th at Hawkstone Hall, Kennington Road, London SE1 (last year's venue).

The Secretary's notice (to which reference should be made for details) will appear in the April Journal and will set a last date, usually in early May, for notification to him of the intention to exhibit. It is usual, and more effective, if the work of the Section can be kept together and I will arrange to notify Cdr. Hatfield of Comet Section exhibits if these are sent to me (photographs, drawings, etc.), or where the member intends to take them to the Hall himself, I am advised of the description and space required before April 21 (see also Bulletin 12).

(MJH)

Section Reports

Detailed analysis of the activity of comets Bradfield 1974 III and Kohler 1977 XIV is in hand and will appear in Section Reports in the Journal in due course, hopefully before the end of 1980. Work is about to start on analysing the 600 or so observations of comet Kobayashi-Berger-Milon 1975 IX. There were some 300 observations each of 1974 III and 1977 XIV.

(MJH)

International Comet Quarterly - Observations

Observations relating to the following comets have now been sent to the ICQ. These total some 800 observations of magnitude and phsyical details in all and work on other comets continues (see Bulletin 12 for details of information sent). Some of these observations have now appeared in recent issues of the ICQ.

Comet			Number of Observations	Number of Observers
Bradfield	1974 III	1974b	292	35
P/Klemola	1976 X	1976j	3	1
P/Griff-Skjellerup	1977 VI	1977b	6	2
P/Encke	1977 XI	-	2	1
Kohler	1977 XIV	1977m	298	33
P/Chernyck	1978 IV	1977l	2	1
Seargent	1978 VI	1978m	37	2
Bradfield	1978 VII	1978c	15	3
P/Wild 2	1978 XI	1979b	42	6
Machholz	1978 XIII	1978l	23	4
P/Ashbrook-Jackson	1978 XIV	1977g	43	4
P/Haneda-Campos	1978 XX	1978j	2	1
Meier	1978 XXI	1979f	22	8
Bradfield	-	1979c	3	2
P/Schwassmann-Wachmann 3	-	1979g	3	1
Meier	-	1979i	9	1
			802	

(MJH)

Observations of Recent Comets

It would be very helpful if those observers who have observations of comets that have not yet been sent to the Director would do so as soon as possible.

I want to take the opportunity of the present slack period to bring up to date our records of recent comets. By the time this Bulletin is in your hands it is unlikely that there will be any further amateur observations of comets 1978f, 1979i and 1979l. I should, therefore, like to complete work on these comets with a view to including a report on them in a Section Report for the Journal. I should like to be able to do this, at least for the more interesting comets such as comet Bradfield 1979l, before members of the Association, most of whom are not specially interested in comets, forget about them.

At the same time we are working to report on well-observed comets from the Comet Section records extending over 30 years.

(MJH)

Comet Designations in 1978

Twenty-six comets passed perihelion in 1978 and were given Roman numeral designations. This was an unusually large number, the previous record being 16 in the year 1974.

(MJH)

Section Meeting

Of the 20 or so Questionnaires received almost all those resident in Great Britain were in favour of a Section Meeting and would hope to attend if held within 50 miles of their home and on a Saturday. More than half would travel to London, and more preferred the months April to October.

However, the 20 replies are only about a quarter of the nominal Section membership and although other BAA members might wish to attend the number of replies received to date does not show an overwhelming wish for such a meeting, so if anyone has not yet returned the form perhaps this is an additional reason for doing so?

(MJH)

LIST OF OBSERVERS (1)

Observer	Location	Principal Instruments
Blaxall, K.W.	Colchester	216 mm f/8 Refl
Bortle, J.E.	Stormville, New York	320 mm f/5.6 Refl
		200 mm f/1.5 Schmidt*
Clark, M.L.	Dowerin, W. Australia	254 mm f/8 Refl
		127 mm f/5 OG
Crick, E.J.	Merchtem, Belgium	152 mm f/8 Refl
Doherty, P.B.	Stoke-on-Trent	419 mm Refl
		254 mm f/4 Refl
Hendrie, M.J.	Colchester	125 mm f/17 OG
		100 mm f/4.5 Cooke Triplet*
Hollis, A.J.	Northwich	300 mm f/7 Refl
		200 mm f/6 Refl
Hurst, G.M.	Earls Barton	260 mm f/6 Refl
Joslin, M.L.	Chelmsford	214 mm f/8 Refl
Keitch, G.S.	Wrington, Avon	300 mm f/5 Refl (1)
		130 mm f/5 OG
McKim, R.J.	Colchester	216 mm f/7.6 Refl (2)
Milbourn, S.W.	Copthorne, Sussex	250 mm f/4.5 Refl
		120 mm 'apogee' OG
Morris, C.S.	Harvard, Mass.	250 mm f/7 Refl
Morritt, P.	Manfield Woodhouse	80 mm f/15 OG
Panther, R.W.	Northampton	310 mm f/8 Refl
		203 mm f/8 Refl
Pickard, R.D.	Hadlow, Kent	415 mm f/3.9 Refl
		215 mm f/8 Refl
Ridley, H.B.	West Chinnock, Somerset	150 mm f/16 OG
		80 mm f/12 OG
		80 mm f/6.3 Ross Express*
Ritchie, K.J.	Musselburgh, Scotland	100 mm f/6.5 Refl
Simmons, K.W.L.	Callahan, Florida	317 mm f/5 Refl
		203 mm f/5 Refl
Smith, P.C.	Chesterfield	50 mm x 10 Binoculars
Taylor, M.D.	Wakefield	70 mm x 15 Binoculars
Tremblay, R.H.	Ste-Foy. Quebec	254 mm f/5.6 Refl
Waterfield, Dr. R.L	Woolston, Somerset	150 mm f/15 OG
		150 mm f/4.5 Cooke Triplet*

Most observers also have smaller telescopes and binoculars as well as the larger instruments listed above.

(1) Has access to 470 mm reflector
(2) Has access to 318 mm and 203 mm OG at Cambridge University Observatory

* Photographic instruments in regular use for comet work.

(MJH)

REPORTING OBSERVATIONS - M.J. HENDRIE

Focal Ratio. In Bulletin 12 I asked for the focal ratio of the instrument used for making magnitude estimates visually to be given as well as the magnification (power) and aperture.

Use of more than one Instrument. I also asked for a clear indication of the instrument used for each part of the observation (e.g. magnitude estimate, tail details) where more than one instrument was used for observations reported on one Report Form.

Method of Magnitude Estimation. There is much discussion of cometary photometry and its shortcomings at present and therefore we want to have before us as much information to analyse as is possible (within reason).

The BAA Comet Section notes have advocated the in focus comet compared with the out of focus star method, often called the 'IN-OUT' or Sidgwick method. I expect, therefore, that most of the observations over the past 30 years at least have been made by this method, but we have not asked for the method to be stated before.

In the USA it has often been popular to use the out of focus comet compared with the out of focus star method usually known as the Bobrovnikoff method, or sometimes the 'OUT-OUT' method. There is some indication that the best method depends on the apparent size of the comet and its degree of condensation. Without going into this difficult subject any further here, except to say that we propose to write a review of the subject for the Bulletin or Journal in due course, may I ask observers to indicate which method they have used, i.e. (I - O) for the method recommended in the Section observing notes (available from me) or (O - O) for the Bobrovnikoff method. Any other methods, please explain!

Comparison Stars. Not all observers give comparison stars with their magnitude estimates. The ICQ may no longer list observations where the source of comparison stars is not given.

Not all observers have access to suitable catalogues but the Director and some other observers have them so that where a careful field sketch has been made and stars are labelled and the comet's brightness estimated in comparison with these, it should be possible for me to obtain a magnitude estimate and give the source of the comparison stars when I pass on data to the ICQ. In any case, for our own analysis, observations unsupported by any explanation of how they were derived are of a lesser value than those fully documented and capable of some checking.

It does require that the field sketch is carefully drawn, the north point accurately shown and either a scale or the diameter of the field shown given to about 10' arc accuracy. Also show all stars visible and try to grade dots to indicate brightness. Small groups, triangles and arcs are particularly valuable in identifying other stars in the field. Where possible the RA and declination should be given to a few arcminutes, but if the time is given to a few minutes and the comet is close to the ephemeris it should be possible to identify the field without them, but it takes more time and where several hundred observations are involved this soon runs into hours of extra work.

Where possible use more than one star or set of stars to estimate the comet's brightness, so that if one star is not suitable or cannot be identified with certainty, then the observation will not be lost.

Position Angles. There has been some confusion in recent years about reports of tail features and comet's motion when points of the compass have been used, e.g. towards the NW, pointing SE, motion NE, especially where the object is in the northern (or southern) sky below the pole. Here NE is north west! The use of Position Angle with 0° (north) measured anti-clockwise should be free of ambiguity, but as usually explained as being measured through east, south and west can still lead to confusion in some minds. In difficult areas the good old terms preceding and following meaning having lesser right ascension (preceding) and greater RA (following), the order in which they cross the meridian,

seems to be foolproof, and there should be no confusion over north and south. So that below the north pole a tail would point towards 'np' if it pointed between pa 270° and 360°, actually between east and north, but NW in the normal use of the term. Similarly a comet moving towards pa 120° would be towards south following or 'sf'. As these terms can only indicate the general direction it is important to give an accurate position angle as well when possible, and be sparing in the use of east and west.

Revision of Observing Notes. At some time these notes will be revised to incorporate all these points, but we do not want to do this at present, as there may be other modifications to be made in the light of experience.

(MJH)

INSTRUMENTS FOR COMET WORK - WITH REASONABLE COST IN MIND - I.G. JACKSON

Having just started work as a trainee technician at Hull University I can now afford to save for some really good instruments for comet work. But while I was at school I had to compromise between quality and price. I want to make some recommendations about instruments.

My first instrument was a pair of 12 x 40 binoculars from the U.S.S.R. These came complete with leather case and filters. The quality is amazing at the price of £32.00; the lens coatings, crisp images and easy focusing make them very good value. Proof of their quality was the splitting of ε Geminorum ($3^m.2$) and the nearby star SAO 078683 ($9^m.0$), the separation being 110", a good test not so much on account of the separation but owing to the large difference in brightness of the two stars. My 12 x 40 binoculars have a field of 6° and an exit pupil of 3.3mm. Similar binoculars from the U.S.S.R. are available as 8 x 30 and 7 x 50.

I can recommend prospective comet observers to make their own equipment. I obtained a 2 inch aperture ultrascope lens from H.W. English for £12 which is of very high quality and can be used up to 200x. I also bought an 18.5mm 4 element Plossl eyepiece for £8.30. This gives a power of 25x and field of 2°.5 when used with the ultrascope lens. The whole instrument has been made up in brass and is mounted on a tripod supplied by English. The total cost was about £30 and probably would have cost £150 if made to order.

I am now saving for some 11 x 80 or 20 x 80 binoculars by University Optics. These I consider to be very good value for money compared with other makes in this range that I have tried. Although the direct sterling equivalent of the US dollar price would ignore carriage, duties, tax and other costs, which could add 50% or more to the price, they would still be well under half the price of the Beck Tordalk range as the following figures show:-

University Optics	Price £	Field °	Exit Pupil mm	Weight (gm)
11x80	100 (?)	4.5	7	2280
20x80	100 (?)	3.5	4	2280
Tordalk				
11x80	400	4.5	7	1570
15x80	400	4.3	5.3	1675
22x80	400	3.0	3.6	1490

(?) Listed in Sky & Telescope, February 1980 at $179.95 ppd (in USA).

I would advise anyone to consider making their instruments and to look out for bargains. I am now making a 4 inch refractor specially for observing known comets and comet seeking. This should extend my observations well below the 9^m possible with my first two instruments.

* * * * * * * * * * * * * * * * *

I am pleased to see a response to my request for comment and opinion on instruments for comet work. Mr. Jackson's first two instruments enabled him to make a start observing comets and while rather small for comet seeking there is no substitute for quality and convenience in operation and this usually means making at least part of one's equipment for oneself.

M.J.H.

FILMS FOR ASTROPHOTOGRAPHY : SOME NOTES - G.J. HODGKINSON

Clearly it is impossible to cover all aspects of astrophotography but the following comments and tables should be helpful, particularly in view of the interest shown in 35mm spectroscopic films and SO 115.

The graph compares spectral sensitivity of a number of films suitable for astrophotography. The relative position of each would depend on processing etc., and should be ignored. Of more importance is the peak sensitivity and cut-off in relation to the spectrum. Sensitivity to certain parts of the spectrum will be enhanced by suitable choice of filter and film, e.g.:

SO 115 with Hα filter : solar photography

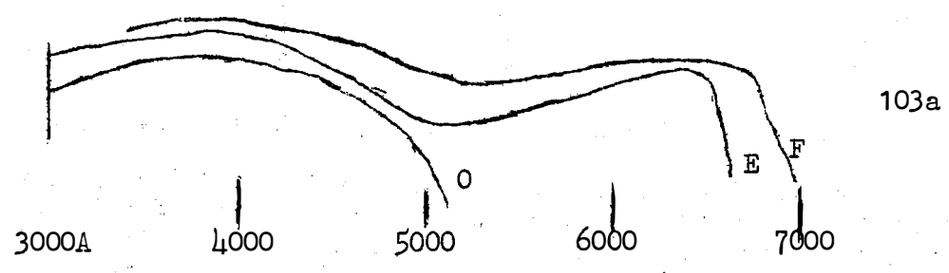
103aE with deep-red filter : emission nebulae

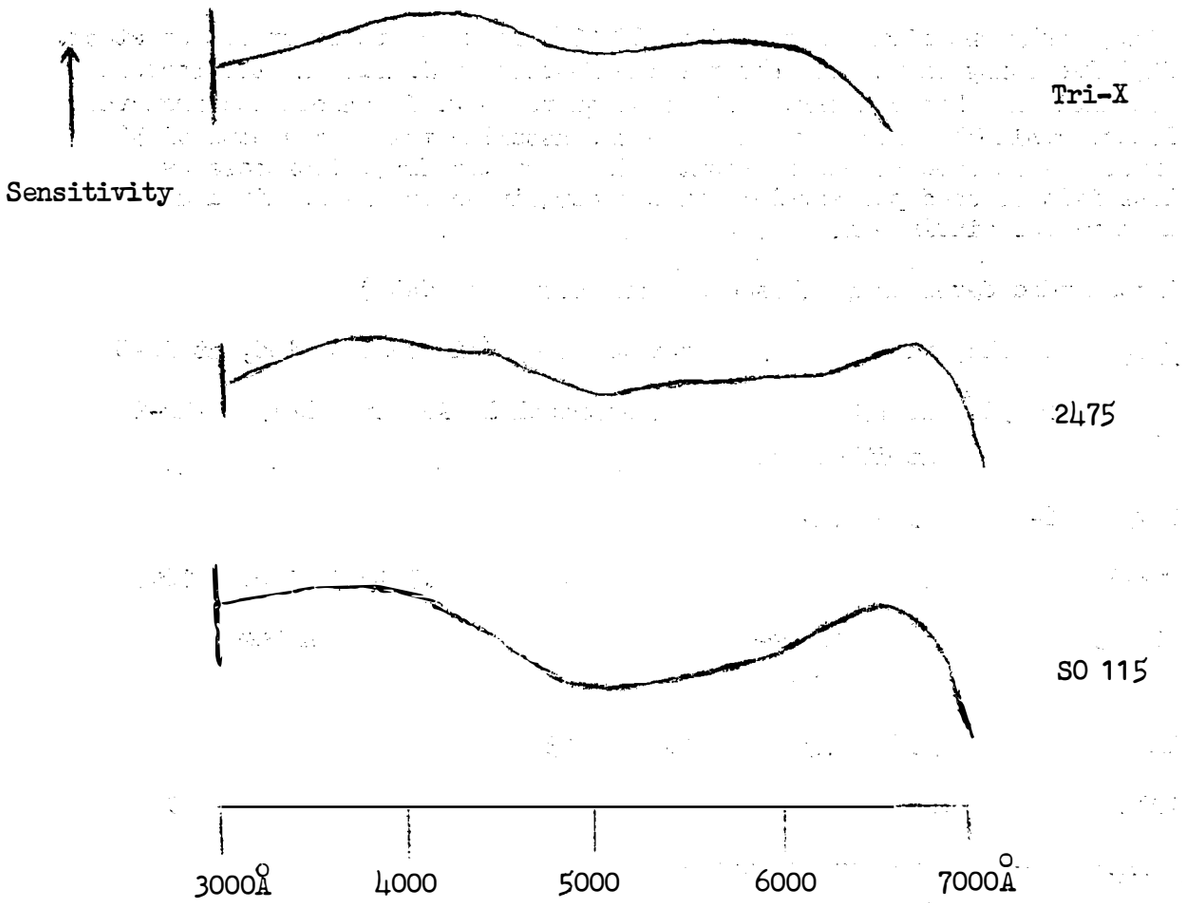
Filters can be obtained which reduce the effects of scattered light from some streetlights.

All spectroscopic films respond to light of wavelength 3000-5000A, but aE and aF are sensitised to 6800 and 7000A respectively, with maximum sensitivity in the region 5600-6600A and 4500-6800 resp. 103aF is panchromatic, 103aO is orthochromatic, and best for photographing blue objects and reflection nebulae, 103aE is best for emission nebulae and red objects.

At first sight, SO 115 pan film, with its extended red sensitivity, would appear to be a good choice for photographing red nebulae. This would be so if it were not for one factor - it is very slow, and choice should go to 2475 (assuming spectroscopic film is unavailable). This is also panchromatic, with extended red sensitivity, and is one of the fastest films available. This will photograph red nebulae, such as the N. America neb., that Tri-X will not detect (as the sensitivity of Tri-X does not extend so far into the red), however, it suffers badly from reciprocity failure (more so than Tri-X). My own experiences are that what can be recorded with 2475 in 10^m can be recorded by Tri-X in 5, and in 1-2^m with spec. film. For exposures shorter than one minute, however, the order is changed and there is little to choose betwwen 2475 and spec. film, both 'faster' than Tri-X. To overcome reciprocity effects, Tri-X is used in cold-cameras. With spec. films this appears unnecessary; further sensitisation can be achieved by treatment with certain chemicals (water being the simplest).

Spectral Sensitivity of monochrome films:





FILM	ASA[1]	GRAIN	USED FOR	SPECIAL USE	COST (per 35mm frame)
103a	(200)	Coarse	Stellar, nebulae and Galaxies, comets.	Narrow band hypersensitising,[2]	3.3p
2475	4000-16000	Coarse	as prec., meteors, aurora, etc.	Fast recording, low illumination, red sensitivity	2.1p
Tri-X	400+	Fine	as prec.	Usable in cold camera	1.3p
SO 115	160	Very Fine	Sun, Moon, Planets	High contrast. Hydrogen-α	1.6p
Infrared	80	Mod. Coarse	Planets, nebulae		8.9p
HS Ektachrome	200	Fine	Most Objects		4.2p

NOTE:

1. ASA rating can depend on processing technique. Pan F can be used instead of Tri-X, for recording faint objects develop in, e.g. microphen.

2. Spectroscopic films have an antihalation backing which may not completely be removed after development. This can be removed by an alkaline wash, prior to fixing, based on borax or sodium carbonate. Do not use an acid stop bath.

3. Prices: these do vary from supplier to supplier, but if you find you are paying much above these rates - look for another supplier. Several firms advertise in the weekly magazine 'Amateur Photographer' (cost 25p) and offer film at advantageous prices. They do not sell spectroscopic

film; only one firm I know offers SO 115 and they are often out of stock. 2475 Recording Film, although not the fastest available, is the fastest available in this country. The cost quoted here is calculated from the lowest available prices known to me and assuming that a cassette of 36 exposures is used at one session. The cost per frame increases as less film is used per session since a certain amount is required as a 'leader' for winding-on.

Recommended development (based on manufacturer's data)

FILM	Develop in:			for the time (minutes) quoted, at 20°C				
	DK 50	HC 110 at dilution:		D76	Microdol X	Acufine	D-19	MWP-2
2475	6-9	4.5-8	(A)					
Tri-X		4	(A)	8	10	5.3(10*)	(17*)	(10*)
SO 115		8	(D)***				4.5**	
		8	(F)+					
IR		3.5	(A)	10	13		7	
103a		18					8	9

NOTES: * for maximum speed
** for maximum contrast
*** for high contrast
+ for moderate contrast

Storage is said to be a problem with spec. films: manufacturer's instructions are to keep at 1°C or below, and -18°C has been recommended for prolonged storage (a few years). The lower temperature is that of a household freezer. The film being removed from cold store a few hours prior to the observing session, and processed as soon as possible after. Storage is clearly less of a problem if the film is used for survey work.

COMET MEIER 1978 XXI (=1978f) - M.J. HENDRIE

This comet was discovered by Rolf Meier, a Canadian amateur astronomer, from near Ottawa, Ontario with a 40cm f/5 reflector and a magnification of 56 on 1978 April 27.08. It was confirmed by Dr. Everhart on April 27.3 and also by Giclas at the Lowell Observatory.

At discovery the comet was around 10^m, diffuse with condensation, and at high northern declination in Draco. It was more than $2\frac{1}{2}$ au from both the Sun and Earth. Early observations by our members showed a small, intense disc about 1 arcmin across with a faint outer coma sometimes reported, and at times an almost stellar condensation suspected. By mid June comet Meier was about $9^m.5$ and 2 arcmin in diameter, moderately condensed. The comet ran into evening twilight as it moved south and reached perihelion on 1978 Nov 8 at 1.14 au, behind the Sun and at southern declination. A few observations were made in December when the comet was about 6^m or a little brighter. Our only observation was from M.L. Clark who made it $5^m.2$ on 1978 Dec 4.8 with a12.5cm f/5 refractor.

The comet was far south until 1979 June when it moved sufficiently far from the Sun and north to be seen low in the sky from the USA where John Bortle started a series of observations on Jun 21, when he found it 11^m, 2.4 arcmin in diameter and diffuse in appearance. It was then 3 au from the Sun and over 2 au from the Earth, but while the distance from the Sun continued to increase the brightness was affected by the Earth's motion which kept the Earth-comet distance to around 2.3 au throughout July and August after which it slowly increased. The comet faded gradually to $11^m.6$ on 1979 Sept 24 when the last observation we received was made, again by John Bortle. The comet remained near declination - 17° during the summer

and autumn as the comet moved towards the ascending node of its orbit. This kept it too far south for satisfactory observation from the British Isles. The comet was sometimes diffuse and sometimes noticeably condensed with a 14^m stellar condensation visible at times.

The 30 observations received from our members were not well distributed along the orbit for the reasons explained above and do not provide a very reliable basis for determining the comet's photometric behaviour. However, it is clear that the comet was intrinsically unusually bright , the absolute magnitude m_o (magnitude at 1 au from both Sun and Earth) being 3.1 from our observations and the comet's brightness varied as the -3.9 power 'n' of the heliocentric distance. In Comet Digest (Sky and Telescope, 1980 January) John Bortle finds the absolute magnitude to be 3.44 and 'n' to be -3.38, using 28 observations including some made nearer perihelion. Thus our figures confirm the general conclusion that comet Meier was a bright comet intrinsically but that its brightness varied in an average way, as the aver m_o for all comets is around 6.0 and the average 'n' around 3.3.

It would not be worthwhile to try to refine our figures but an advantage of subscribing to the ICQ project is that the combined body of observations of this and other comets should provide an adequate number of reliable observations covering all observable parts of the comets' orbits.

The following contributed observations of comet Meier 1978 XXI:

Observer	Location	Instrument
J.E. Bortle	Stormville, New York	32cm f/5.6 Refl
M.L. Clark	Dowerin, W. Australia	12.5cm f/5 OG
M.J. Gainsford	Nuneaton	21cm Refl
M.J. Hendrie	Colchester	12.5cm f/17 OG
G.M. Hurst	Earls Barton	26cm f/6 Refl
G.S. Keitch	Stoke Gifford, Bristol	20cm f/4 Refl
R.W. Panther	Walgrave, Northampton	10.5cm Binocs
H.B. Ridley	Godalming	11.5cm f/15 OG
J.D. Shanklin	Cambridge	32cm f/18 OG
R.H. Tremblay	Lac-Megantic, Canada	25cm f/5.6 Refl

COMET MEIER 1979i - M.J. HENDRIE

Rolf Meier's second discovery with the 40cm reflector came on 1979 September 20.1 when he found a 12^m comet described as diffuse with condensation, also at high northern declination in Draco.

This comet moved slowly southwards with decreasing right ascension passing through Ursa Major and into Gemini and by mid March it was in Orion. Comet Meier passed perihelion on 1979 Oct 17 at 1.4 au from the Sun. It did not exceed $11^m.5$ and was generally small and rather diffuse, but short tail features and starlike condensations were reported from time to time.

Thirty one observations have been received to date by 4 observers, G.M. Hurst, H.B. Ridley, G.S. Keitch and M.J. Hendrie, but Graham Keitch contributed 26 of them, a very valuable achievement.

The Director made the last observation to hand so far when on 1980 Jan 13.8 a 60 minute exposure with the 10cm f/4.5 Cooke Triplet on 103a O film showed a very faint image 40" across and 14^m or a little fainter. The BAAC report that this photograph failed to show the comet was based on information available at the time, but a revised ephemeris received after the Circular had gone to press gave positions up to 30 arcmin from the earlier one, and a re-examination of the photograph showed a faint image in the correct position.

A further report will appear when all the observations are to hand and if any observers have observations not yet copied to the Director please send them in. The comet is likely to be too faint for further observation, except with large telescopes, by the end of the month.

COMET BRADFIELD 1979l - M.J. HENDRIE

W.A. Bradfield (Adelaide) discovered his tenth comet on 1979 Dec 24.75, a 5^m object moving south in Scorpio. The comet was described as diffuse with central condensation and a tail more than 1° long. The discovery was made with the 15cm f/5.5 refractor and a magnification of 26x Perihelion passage was on 1979 December 21 at 0.55 au from the Sun.

In late December and early January the comet moved south before moving rapidly north passing the Earth at about 18 million miles on January 26 and was well placed for observation from mid northern latitudes by the end of January, but it faded rapidly, generally being $\frac{1}{2}$ magnitude fainter than the BAA Circular. By mid March it is a few degrees following the Pleiades (and its motion is now very slow) and of about 12^m.

Some 80 observations have been received and a full report will appear in Bulletin 14 when all the observations should be to hand. As the weather in the British Isles in February and March has been unusually cloudy many observers did not see the comet until it was already fainter than 8^m and have been able to make few observations. I should be glad to receive all observations as soon as possible after the apparition is over; by early April the comet will be getting low in the west by the end of astronomical twilight and combined with its faintness and diffuseness will probably be beyond the reach of most of us.

COMETS IN 1977

(Continued from Bulletin 12)

1977k = 1978 III P/Arend-Rigaux. Originally discovered in 1951, P/Arend-Rigaux made its 5th appearance when recovered by R.E. McCrosky on 1977 August 15.3 using the 155cm reflector at the Agassiz station of Harvard Observatory, the recovery position indicating a correction of ΔT = +0d.07 to the prediction in the Handbook 1977. The comet was stellar in appearance, magnitude approx. 19. An independent recovery was made by Z.M. Pereyra on 1977 August 19.3 using the 154cm reflector at Bosque Alegre.

The comet brightened to magnitude 17 by 1977 November 17 when D. Allen (Anglo-Australian Observatory) using the 390cm reflector noted a stellar nucleus with a small halo and a tail 15" long in p.a. 310°. On December 2, T. Furata (Tokai) reported the magnitude as 14 whilst in February 1978, J.E. Bortle (New York) recorded visual observations with his 32cm reflector close to magnitude 13. By March 5 the comet had faded to magnitude 16 when H. Kosai (Tokyo) using the 105cm Schmidt telescope recorded a tail 4' long in p.a. 70°.

1977l - 1978 IV P/Chernykh. Discovered by N.S. Chernykh on 1977 August 19.0, the comet appearing as a 14th magnitude diffuse object with central condensation. On Sept. 1 and Sept. 2, H.E. Schuster (European Southern Observatory) noted a fuzzy nucleus with an apparently split tail 30" long to the west. An exposure by K.J. Vaux (Woolston Observatory) on Sept. 12 showed a fork tail in p.a. 270° (the brighter component) and in p.a. 240°, the magnitude of the comet being 13.5. Visual observations by J.E. Bortle (New York) between Sept. 11 and December 8 using his 32cm reflector yielded magnitudes of 12.5 at the beginning of the period to 13.0 by the end. A photographic observation by G.H. Rutter (Woolston Observatory) on 1978 January 6 gave a magnitude of 15.0.

It was quickly realised that the orbit of 1978 IV was of short period and the following elliptical elements by Dr. B.G. Marsden are based on 221 observations 1977 August 19 to 1978 March 4, perturbations by all nine planets being taken into account (IAUC 3236):

T	1978 Feb. 14.9343	E.T.	Epoch 1978 Feb. 21.0 E.T.	
ω	266°.7020		e	0.594355
Ω	134.1144	1950.0	a	6.331669 AU
I	5.7278		n°	0.0618624
q	2.568413	AU	p	16.93 yrs.

1977m = 1977 XIV Kohler. Discovered by M. Kohler (Quincy, California) on 1977 September 4.2 using a 20cm reflector when he found a 10th magnitude diffuse object near the border of Corona Borealis and Bootes. The comet became the most widely observed of those in 1977 and quickly brightened to mag. 9.5 by September 12 and to 8th mag. by the end of the month, a peak being reached during the first half of November at mag. 6.8. By the end of November a slight fading was in evidence and a month later magnitudes reported were around 8.5. An exposure on September 12 by Dr. R.L. Waterfield (Woolston Observatory) showed a fanlike elongation to the NE and on September 30, J.E. Bortle (New York) using his 32cm reflector saw a narrow tail 25' long in p.a. 60°. On October 8 S. O'Meara (Harvard) using a 23cm refractor noted three tails (a) 25' long in p.a. 50°, (b) 10' long in p.a. 0° and (c) 5' long in p.a. 295°. As reported elsewhere in this Bulletin, a detailed report of Comet Kohler will appear in the JBAA in due course.

The following elements by Dr. B.G. Marsden are based on 326 oberservations 1977 Sept. 6 to 1978 March 30, perturbations by all nine planets being taken into account (MPC 4540):

T	1977 Nov. 10.56995 E.T.	Epoch	1977 Nov. 24.0 E.T.
e	0.9995455	ω	163°.48766
		Ω	181.82341 1950.0
q	0.9905752 AU	i	48.71823

1977n = 1978 XVII P/Comas-Sola. On its sixth return since discovery in 1926, P/Comas-Sola was recovered by R.E. McCrosky, G. Schwartz and C.Y. Shao on 1977 Sept 11.2 using the 155cm reflector at the Harvard Observatory's Agassiz station. The comet appeared as a weak diffuse spot, magnitude 20 - 20.5, the correction to the prediction in the Handbook 1977 being ΔT = -0d.06.

Although recovered in 1977, the comet was better placed for observation in the autumn of 1978 and was bright enough for visual observation with larger instruments. A. Hale (Annapolis) observing on 1978 Oct. 8.4 estimated the magnitude at 13.0 using a 41cm reflector, noting a strongly condensed coma. On Nov. 29.4 J.E. Bortle (New York) just detected the comet at mag. 13.4 using his 32cm reflector.

1977o = 1978 I P/Schuster. Discovered by H.E. Schuster (European Southern Observatory) on 1977 Oct. 9.2 as a 17th magnitude object in Sculptor. The comet showed some fuzziness to the NE which on Oct. 14 was resolved as a tail 20" long using the 100cm Schmidt telescope. Prediscovery images were found on plates exposed on Sept. 5, 6 and 7 which enabled elliptical elements to be determined at an early stage. A long exposure with the 100cm Schmidt on Oct. 16 showed a tail 1' long in a 30° fan to the NNE, a feature still well visible on Dec. 3. The comet remained a relatively faint object, the maximum magnitude being around 16. By 1978 Jan. 8, R. West using the 100cm Schmidt, found the comet very faint and diffuse.

The following elements have been calculated by Dr. B.G. Marsden using 33 observations 1977 Sept. 5 to 1978 Jan 8, perturbations by all nine planets being included (MPC 4603):

T	1978 Jan 6.81658 E.T.	Epoch	1978 Jan 12.0 E.T.
ω	353°.91619	e	0.5740391
Ω	50.83706 1950.0	a	3.8208753 AU
i	20.44377	n°	0.13196531
q	1.6275435 AU	p	7.47 yrs.

1977p = 1977 XII P/Sanguin. Discovered in Aquarius by J.G. Sanguin using the 51cm double astrograph at El Leoncito on 1977 Oct. 15.1. Of magnitude 16, the comet was diffuse with some condensation and with a very faint tail to the NE. Later, an independent discovery on Oct 11.1 was reported by C. Torres (Cerro El Roble) the magnitude being given as 13 - 14. A further prediscovery image was found on a plate exposed by S.J. Buss and T. Lauer (Hale Observatories) on 1977 Sept. 13.3, the magnitude being 14.5. The faint tail was still in evidence by mid-November, the magnitude of the comet being around 16. Later, the comet faded, the last observation being

Obtained on 1978 Jan 31.

This comet was another moving in a short period orbit and the following elements have been provided by Dr. B.G. Marsden from 13 observations 1977 Sept 13 to 1978 Jan 31, perturbations by all nine planets being taken into account (MPC 4603):

T	1977 Sept. 17.55623 E.T.	Epoch 1977 Sept. 14.0 E.T.	
ω	162.08305	e	0.6639127
Ω	182.26598 1950.0	a	5.3872660 AU
i	18.63734	n°	0.07882273
q	1.8105915 AU	p	12.50 yrs.

1977q = 1977 X Tsuchinshan. Discovered by Tsuchinshan (Purple Mountain Observatory, Nanking) on 1977 Nov. 3.6 as a diffuse 13.5 magnitude object in Pisces. On Nov. 8.2 E. Helin and E. Shoemaker (Palomar) described the comet as diffuse with condensation and with evidence of a faint tail in p.a. 70°. C. Torres (Cerro El Roble) reported a fan shaped tail 5' long to the ENE on Nov. 12.9. During late November and early December magnitudes reported were around 16 with the comet slowly fading but observations were obtained as late as the summer of 1978.

The following elements are by Dr. B.G. Marsden and based on 56 observations 1977 Nov. 3 to 1978 Sept. 6, perturbations by all nine planets being taken into account (MPC 5030):

T	1977 July 24.80807 E.T.	Epoch 1977 Aug. 5.0 E.T.	
e	0.9994194	ω	318°.16170
		Ω	4.58096 1950.0
q	3.6030338 AU	i	168.54320

1977r = 1978 X P/Kojima. Making its first return since discovery in 1970, P/Kojima was recovered by H. Kosai and Hurukawa on 1977 Dec. 9.8 using the 105cm Schmidt telescope at the Tokyo Observatory's Kiso station. The comet was diffuse without condensation, magnitude 19. C. Kowal was able to identify images of the comet on plates taken on Dec. 8.4 and on Dec. 9.2 with the Palomar Schmidt telescope. Observations by T. Seki (Geisei) on 1977 Dec. 20, T. Furuta (Tokai) on 1978 Jan 14 and H. Kosai (Kiso) on 1978 March 2 all gave the magnitude as 18. The prediction in the Handbook 1977 required a correction of $\Delta T = -0d.18$.

1977s = 1978 XXIV P/van Biesbroeck. The second return since the discovery apparition of 1954, P/van Biesbroeck was recovered on 1977 Dec. 17.4 by R.E. McCrosky using the 155cm reflector at the Agassiz station of Harvard Observatory. The comet was diffuse, of magnitude 20, the recovery position being in good agreement with the prediction in the Handbook 1978. The comet brightened to around magnitude 15 by 1978 May, later fading to 18 in September.

1977 XI P/Encke. This comet was reobserved in 1977 but did not receive a letter designation as it was observed at aphelion in 1975. The first observation appears to have been made on 1977 July 14.4 with the magnitude close to 13. By July 23, J.E. Bortle (New York) was reporting a visual magnitude of 10.2 (32cm reflector) and on Sept. 5.3 B Nikolau (Palmerston North) using a 20cm reflector estimated a magnitude of 8.8 although two days later he obtained 9.5. A plate exposed by H.E. Schuster (European Southern Observatory) on Sept. 12.0 showed a broad tail 1'.5 long in p.a. 290° (sunward) and possibly a second tail in p.a. 120°. The coma diameter was 27" arc with a sharp condensation. By October 14, the nuclear magnitude was 15.4 (A.C. Gilmore, Carter Observatory).

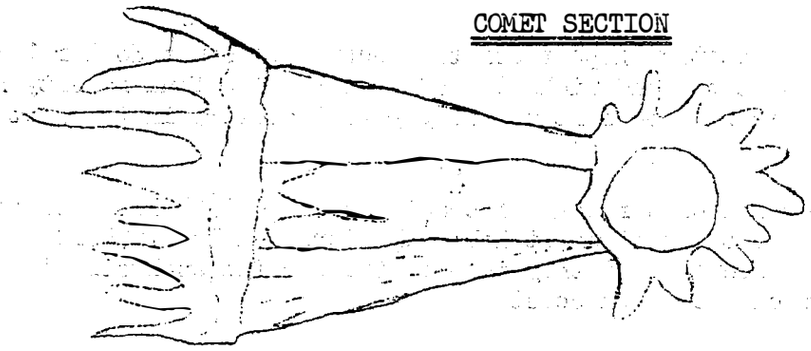
Of the 1977 comets listed in Bulletin 12, the following have now been assigned Roman Numerals:

1977d P/Tempel (2)	= 1978 V
1977g P/Ashbrook-Jackson	= 1978 XIV
1977h P/Whipple	= 1978 VIII
1977i P/Tempel (1)	= 1978 II
1977j P/Wolf-Harrington	= 1978 VI

S.W. MILBOURN

THE BRITISH ASTRONOMICAL ASSOCIATION

COMET SECTION



IST IMMANT
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BULLETIN NO. 14 OCTOBER 1980

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FROM THE DIRECTOR

Since the last Bulletin only the new comet Cernis-Petrauskas 1980k has been bright enough for a few of our members to observe, but there are four comets on the way that should be observable more easily, comets Encke, Stephan-Oterma, and Tuttle are all making returns and comet Bowell should be visible soon in the larger amateur telescopes and remain under observation until 1983. This Bulletin contains information on all of these comets.

A few more Observer's Record Reply Forms have been received, and a short second list of observers of the Section is given below, but there must be many more still to be returned and I should still like to receive these.

Thanks are due to those who provided material for the Association's Exhibition Meeting last May, enabling us to join other Sections in putting work on display. However, very few members supplied most of the exhibits, and hopefully with more comets to observe it will be possible to provide a more representative display next year.

It is a pleasure to record the award of the Association's Merlin Medal to Stan Milbourn for his work on the orbit of comet P/Tsuchinshan 2.

Graham Keitch has agreed to become an Assistant to the Director and will join A.F. Jones, P.B. Doherty, S.W. Milbourn and H.B. Ridley in helping to run the Comet Section.

The report of comet Bradfield 1979l has been held over to the next Bulletin so as not to delay further the publication of this one, which we want to be in the hands of members before the apparitions of the coming comets get really under way.

An Apple microprocessor has been used by the Director for trial reductions of photometric data for comet Bradfield 1979l, and offers of computing help have also been received from Jonathan Shanklin and G.O. Hayward. I hope that the proper organisation of these facilities will enable more work to be done more quickly on the reduction of observations and the preparation of additional information on observing conditions and comparison stars for predicted comets.

Progress is also being made in other areas:

Section Reports

Work is complete on a Section Report for the Journal on comet Kohler 1977 XIV written jointly by Graham Keitch and Michael Hendrie for which Paul Doherty has produced the figures; this will be sent to the papers Secretary in the next few days.

Harold Ridley is working on a report of comet Bradfield 1974 III also for the Journal, and will also be looking at comet Kobayashi-Berger-Milon 1975 IX; these reports take some time to complete as they involve the careful analysis of several hundred observations for each comet.

International Comet Quarterly

All the BAA observations for comet Bradfield 1974 III have now been published in the ICQ. Observations for further comets will be prepared during the next few months in the form required by the ICQ project.

Observing Notes

Harold Ridley is also looking at a revision of the Observing Notes for members which will include recommendations made in the Bulletin from time to time, and make it clear what information is required so that the data can be more readily extracted for Section Reports and for sending to the ICQ.

Comparison Stars

Graham Keitch will be looking at the problem of providing suitable comparison stars for comets fainter than the usual catalogues such as the SAO. We are co-operating with other groups in this including a Dutch group, and hope to include a report of progress in the March Bulletin.

The International Halley Watch

NASA's Planetary Program Office is conducting a study of an International Halley Watch (IHW) at the Jet Propulsion Laboratory, with a view to co-ordinating space and Earth-based observations during the forthcoming apparition.

The principal aims would be:-

1) To Stimulate and co-ordinate scientific observations throughout the entire apparition.

2) Help ensure that observing techniques and instrumentation are standardised as far as possible.

3) Help ensure that results are archived and documented.

4) To receive and distribute data to astronomers, and inform the public and media.

5) To stimulate instrument development.

The IHW is not yet an official NASA program but is still in the study stage. Views on the whole proposal and amateur participation in particular have been requested by the IHW Leader, Dr. L.D. Friedman, and I have replied. Should this project get the go ahead we hope to have a direct line of communication, and more information on its development will be given in later Bulletins.

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LIST OF OBSERVERS (2)

Observer	Location	Principal Instruments
Feijth, H.	Goutem, Netherlands	155mm f/5 refl., 90mm f/15 OG 75mm f/4 telephoto
Gainsford, M.J.	Hinckley, Leics.	209mm f/6 refl.
Hindley, Dr. K.B.	Dringhouses, York: I.of Man.	270mm f/8 refl., 130mm f/5 OG
Shanklin, J.D.	Cambridge	318mm & 203mm OG (Univ. Obsy)

COMETS DISCOVERED AND RECOVERED IN 1980 (up to end September)

-----	P/Encke	(no longer given annual designation)
1980a	P/Forbes	
1980b	Bowell	
1980c	P/Honda-Mrkos-Pajdusakova	
1980d	P/Wild 3	(new periodic comet)
1980e	Torres	
1980f	P/Brooks 2	
1980g	P/Stephan-Oterma	
1980h	P/Tuttle	
1980i	P/Borrelly	
1980j	P/Kohoutek	
1980k	Cernis-Petrauskas	
1980l	Russell	
1980m	P/Harrington	
1980n	P/Reinmuth 2	

COMET P/ENCKE 1786 I

Comet Encke is making one of its most favourable returns for many years, being well placed for observation in the late autumn for Northern hemisphere observers, reaching a northern declination of +60° in late October and a magnitude of around 7^m. However, it moves rapidly and every opportunity should be taken to make observations, especially important being total magnitude, size and shape of the coma, and tail activity. Comet Encke is one of the comets that recently had the period of rotation of the nucleus determined from a study of features in the head, so special note should be taken of any asymmetry of the central condensation and development of temporary features in the coma.

The comet had a magnitude of 20 (m_2) on 1980 Aug 8 which is in line with the ephemeris in the 1980 HANDBOOK, but the comet brightens quickly and it should be around 10^m by mid October.

MJH

COMET STEPHAN-OTERMA 1980g

Comet Stephan-Oterma 1980g was recovered by H.-E.Schuster at the La Silla station of the European Southern Observatory on 1980 Jun 13.3 at 18 magnitude. The position was in good agreement with the ephemeris based on a new orbit by D.K. Yeomans of the Jet Propolsion Laboratory published in the IAUC 3488 from which the following ephemeris was taken. NOTE: the ephemeris in the Handbook differs considerably from this about the time of closest approach and should not be used to locate the comet. Elements (rounded off from IAUC):

T	=	1980 Dec. 5.2244 ET		e	= 0.86
Peri	=	358°16) 1950.0		a	= 11.24 a.u.
Node	=	78.51)		P	= 37.70 years
Inc	=	17.98			
q	=	1.574 a.u.			

Date	R. A. (1950)	Decl.	Delta	r	Elong.	Mag.
1980 09 18	04 13.37	+00 06.4	1.227	1.853	111.9	12.5
1980 09 28	04 29.59	+01 00.9				
1980 10 08	04 44.76	+02 10.4	0.985	1.736	122.2	10.9
1980 10 18	04 58.46	+03 44.0				
1980 10 28	05 10.28	+05 52.8	0.790	1.647	134.6	9.6
1980 11 07	05 19.73	+08 48.1				
1980 11 17	05 26.42	+12 38.7	0.653	1.591	150.9	8.6
1980 11 22	05 28.71	+14 55.2				
1980 11 27	05 30.33	+17 24.3	0.612	1.578	160.7	8.3
1980 12 02	05 31.31	+20 03.4				
1980 12 07	05 31.77	+22 48.9	0.594	1.575	171.1	8.2
1980 12 12	05 31.88	+25 36.3				
1980 12 17	05 31.83	+28 20.8	0.599	1.582	174.8	8.3
1980 12 12	05 31.85	+30 57.8				
1980 12 27	05 32.14	+33 23.6	0.628	1.599	165.2	8.6
1981 01 01	05 32.92	+35 35.3				
1981 01 06	05 34.38	+37 31.3	0.679	1.625	155.3	9.0
1981 01 16	05 39.88	+40 34.7				
1981 01 26	05 49.19	+42 37.9	0.838	1.705	138.4	10.3
1981 02 05	06 02.08	+43 49.9				
1981 02 15	06 17.98	+44 20.4	1.058	1.813	124.8	11.8

According to Vsekhsvyatskii (Physical Characteristics of Comets) comet 1867 I was discovered in Aries by Coggia at the Marseilles Observatory on 1867 Jan 22 when it was about 7 magnitude. The Observatory's Director was at that time named Stephan and the comet seems to have acquired his name. Tempel also discovered the comet independently on January 28.

The comet was rediscovered accidently by Dr. Oterma at Turku Observatory on 1942 Nov 6 when it was about 12^m. The identification was made by Dr. Whipple of Harvard. As comet 1942 IX it reached magnitude 10, and showed tail and nuclear activity. A long series of observations was made by G. Van Biesbroeck at Yerkes Observatory with the 24 inch reflector.

There is an interesting article on the prospects for the 1980 apparition in International Comet Quarterly for 1980 July, by Charles Morris and Daniel Green in which they report on their analysis of the observations for the two earlier apparitions, and they find that the comet brightens rapidly with decreasing solar distance and it could reach 8 magnitude by December, some 4 magnitudes brighter than the ephemeris in the Handbook suggests (that being applicable to the nuclear magnitude m_2). Naturally any prediction is liable to be in error, but IAUC 3515 reports observations by John Bortle which give for 1980 Sept. 11.4 a coma diameter of 1'.1 and 12m.8, which is in good agreement with the predicted magnitudes of Morris and Green.

Every opportunity should be taken to observe this comet, as it has only been observed at two previous apparitions and its photometric behaviour seems to be rather unusual. G.S. Keitch (Rington, Avon) reports observing this comet on 1980 Oct. 3.04 and Oct. 8.10 when he found it to be moderately condensed, diameter 1'.8, magnitude 10.3 (30cm reflector x 62)

MJH

COMET BOWELL 1980b

The second comet of 1980 was discovered by Dr. Ted Bowell at the Lowell Observatory using the 33cm (13 inch) photographic telescope used for the discovery of Pluto. It was reported in IAUC 3461, and prediscovery images were used for a preliminary orbit. This showed the comet to be beyond Jupiter.

Minor Planets and Comets circular (MPC) 5413 gives the following elements for the orbit (rounded off below):

T	=	1982 Mar 12.28 ET	Peri	=	134°.76	
q	=	3.36 a.u.	Node	=	114.18	1950.0
e	=	1.06	Inc		1.67	

The ephemeris below is from MPC 5419

Date	ET	R. A. (1950)	Decl.	Delta	r	Elong.	Phase	ml
1980	10 28	11 51.47	+02 15.3	6.454	5.694	37.2	6.1	15.1
1980	11 07	11 58.58	+01 31.2					
1980	11 17	12 05.37	+00 49.4	6.087	5.556	53.5	8.2	14.9
1980	11 27	12 11.80	+00 10.3					
1980	12 07	12 17.72	-00 25.0	5.669	5.418	70.4	9.9	14.6
1980	12 17	12 23.05	-00 56.2					
1980	12 27	12 27.65	-01 22.1	5.223	5.282	88.1	10.7	14.3
1981	01 06	12 31.41	-01 42.4					
1981	01 16	12 34.18	-01 56.0	4.777	5.147	106.7	10.5	14.0
1981	01 26	12 35.89	-02 02.5					
1981	02 05	12 36.44	-02 01.6	4.366	5.016	126.5	9.1	13.7
1981	02 15	12 35.81	-01 53.2					
1981	02 25	12 34.05	-01 37.7	4.023	4.886	147.4	6.3	13.4
1981	03 07	12 31.24	-01 16.1					
1981	03 17	12 27.62	-00 49.9	3.778	4.759	169.0	2.3	13.2
1981	03 27	12 23.48	-00 21.2					
1981	04 06	12 19.17	+00 07.6	3.650	4.635	168.5	2.5	13.0
1981	04 16	12 15.09	+00 33.9					
1981	04 26	12 11.61	+00 55.4	3.636	4.513	147.0	7.0	12.8
1981	05 06	12 09.03	+01 10.1					
1981	05 16	12 07.61	+01 16.5	3.716	4.395	126.6	10.6	12.8
1981	05 26	12 07.49	+01 14.1					

13^m by Although the comet was only $16^m.5$ at discovery and will probably be only the Spring of 1981, it will be of considerable interest because it will be in view for a long time, probably several years. With perihelion not until 1982 March it should even be within the reach of amateurs for two years or more, and may reach 10^m about the time of perihelion.

Comet News Service for 1980 July gives a very interesting account of work on comet Bowell so far, including the results of a photograph taken on May 5 with the 1.5 m astrometric telescope of the USNO at Flagstaff, which showed a symmetrical coma 20" across which at a distance of 6.55 a.u. corresponds to a real diameter of 100,000 km. Comet Bowell would, therefore, appear to be another large comet (see comet Meier 1978 XXI in Bulletin 13).

CNS reports that Dr. Spinrad obtained spectra of the comet last Spring and found it remarkable for its lack of emission lines with no trace of CO^+, N_2^+, CN or (O1), while comet P/Schwassmann-Wachmann I shows CO^+ even at minimum light. Therefore comet Bowell appears to be exclusively dust, at least at present.

Comet Bowell may not become spectacular but it does seem to be of exceptional interest to professional observers with large spectographs, and careful monitoring of its brightness by the Section might be valuable in the event that this comet undergoes any short term fluctuations in brightness or appearance. Therefore observers are asked to observe this comet when possible, giving careful estimates of the faintest comet that should have been seen in cases of negative observations.

MJH

COMET CERNIS-PETRAUSKAS 1980k M.J. HENDRIE

This comet was originally reported to the IAU Central Bureau for Astronomical Telegrams as discovered by Chernykh and Petrauskas. The report gave the discovery date as 1980 July 31.71, the magnitude as 9 and the motion as 20' day eastwards.

Observations with the 125mm refractor by H.B. Ridley and M.J. Hendrie at Colchester on Aug 3.9 failed to show the comet, and negative reports were also received from R. McKim and R.W. Panther. Leter IAUC 3499 reported the comet had not been confirmed and that the first discoverers name was Cernis not Chernykh.

Confirmation was delayed until IAUC 3504 dated Aug 20 which reported that P. Wild had photographed the comet on 1980 Aug 2.9 at the Zimmerwald station of the Berne Astronomical Institute, and had found it to be 11 magnitude and to have had a daily motion greater than originally reported. It would have been about 2 degrees further east on Aug 3.9 than the extrapolated position from the original daily motion, no doubt explaining why it was not found by several visual observers. It would have been just off the edge of a photograph taken on Aug 3.9 by Ridley and Hendrie.

Observations received from members have so far been very few, and several negative observations have been received. However Graham Keitch observed it on several evenings about the end of August and found it a small difficult object of about $11^m.8$ fading to below 12 mag by early September. A 36 minute exposure on 103a-O film with the 100mm aperture f/4.5 camera at Colchester by M.J. Hendrie on 1980 Sept. 6.9 showed a faint image of about $12\frac{1}{2}$ magnitude with a faint circular coma $1\frac{1}{2}$' across and an almost stellar central condensation of about 14 mag.

IAUC 3514 gives observations by John Bortle with his 32 cm reflector, for Sept. 8.0 coma diameter 2'.2 and $11^m.5$ and for Sept. 12.0 $11^m.6$. However, the same circular gives observations by Machholz with a 25 cm reflector for Aug 31.2 of 1'.5 coma diameter and $12^m.6$ and Sept. 7.2, $12^m.9$ more in line with observations made over here.

There is no doubt that comet Cernis-Petrauskas was a difficult object and it is unlikely that there will be any more amateur observations now, as it is fading quickly. If any readers have observations of this comet, or made serious attempts to find it without success, the Director would like to receive their reports.

Extracts from BAAC 609

Comet P/Encke

Visual observations on 1980 Oct. 2.98 and Oct. 8.08 by G.S. Keitch (Rington, Avon) showed the comet to be very diffuse with a coma diameter of 2'.9 and a total magnitude of 10.7 (30cm reflector x 62). A 40 min. exposure on 1980 Oct. 5.0 by H.B. Ridley and Dr. R.L. Waterfield (Woolston) showed a very diffuse image, estimated magnitude 13 (15cm f/4.5 Cooke triplet). The faintness and diffuseness of Comet Encke photographically was confirmed by a 40 min. exposure by M.J. Hendrie (Colchester) on 1980 Oct. 7.97, the plate showing a coma diameter of 3', total magnitude 12.5 (10cm f/4.5 Cooke triplet. Both exposures were on 103a-0 emulsion.

Comet P/Tuttle 1980h

G.S. Keitch also reports a visual observation of this comet on 1980 Oct. 8.14 when he found it large and very diffuse, coma diameter 3', magnitude 10.6 (30cm reflector x 62). A 30 min. exposure by M.J. Hendrie confirmed the size and diffuseness of the comet and noted a faint condensation, total magnitude 12.0 (10cm f/4.5 Cooke triplet). The exposure was on 103a-0 emulsion.

COMET P/TUTTLE 1980h

H.P. Tuttle of Harvard College Observatory discovered six comets during the period 1858-1866. Discovering a comet is one way of ensuring that one's name will not be entirely lost to posterity, and if the comet happens to be of short period then posterity will be reminded at regular intervals. Tuttle was unusually fortunate in this respect, as four of his six comets were of short period - and not only that, for all four of his comets are of special interest. Three of them are associated with well-known meteor showers: Tempel-Tuttle with the famous Leonids, Swift-Tuttle with the Perseids which unfailingly appear each August (and are building up to what may be a very high maximum as the comet approaches perihelion in 1982 or thereabouts) and P/Tuttle with the modest Ursid stream which may yet repeat its strong display of 1945. The fourth of Tuttle's comets, P/Tuttle-Giacobini-Kresak, apart from its propensity for getting lost, indicated by its tripartite name, achieved notoriety in 1973 by experiencing two of the greatest cometary outbursts ever observed, on each occasion increasing its brightness by no less than ten magnitudes.

Cometary nomenclature is not an exact science, and the discoverer may be cheated of his due recognition by some quirk of the somewhat flexible rules. Comet P/Tuttle was in fact discovered by Mechain in 1790, sixty-eight years before Tuttle picked it up, and in justice the comet should be known as P/Mechain-Tuttle. Poor Mechain had rather a raw deal with his comets, for another of his discoveries visible now in the northern sky not far from the position of P/Tuttle, is known by somebody else's name: Comet P/Encke. Comet searching is a chancy business in more ways than one.

The current apparition of P/Tuttle is the tenth on record; since its rediscovery by Tuttle in 1858 the comet has been missed at only one return, that of 1953, when the circumstances were as unfavourable as they can be. The present circumstances are very favourable, indeed more so than at any apparitions since those of 1790 and 1858. The orbit of the comet is interesting in three respects: the period of 13.7 years is unusual and aphelion is just beyond the distance of Saturn, the inclination of 54°.5 is one of the highest for short-period comets with direct motion, and the descending node is only 0.02 AU from the orbit of the Earth, making it possible for the comet to approach us very closely. It is this latter circumstance that enables the Earth to encounter perturbed particles from the comet, giving rise to the Ursid meteor shower on December 22 of each year. Perihelion is only 27° ahead of the descending node, which means that if it occurs within a few weeks of that date there will be a fairly close approach and the comet will be reasonably bright. For a nodal encounter perihelion would be on January 12; on the present occasion it is on December 14.7, and the minimum distance is just short of 0.5 AU. In 1790 it was 0.38, and in 1858, 0.76, so the current apparition is comparable in that respect.

The orbit of P/Tuttle is very stable, as will be seen from an inspection of Table II. The stability arises from the high inclination together with the location of the ascending node, making a very close approach to Jupiter impossible.

With ten apparitions on record already, and, with little change in the orbit, the prospect of many more to come, we have an excellent opportunity to investigate the vexed problem of secular changes in the intrinsic brightness of this comet. According to Vsekhsvyatskii the value of H_{10} decreased by nearly four magnitudes during the period 1790 - 1939, i.e. about one magnitude every three revolutions. This seems somewhat excessive and indeed my own calculation for the return of 1967 give $H_{10} = 8.0$, the same as it was more than a century ago. There is clearly a need for a thorough investigation of this question, which underlines the importance of our obtaining the maximum number of good visual magnitude determinations over as long an arc as possible.

One difficulty in the case of P/Tuttle is that most of the magnitudes have been determined during short arcs around perihelion, and as the latter is close to 1.0 AU this, together with the scatter in the magnitude estimates, make the value of n in n log r virtually indeterminate.

At the time of writing (mid-October) comet Tuttle is in the south-preceding part of Ursa Major, not far from Theta UMa. During November the comet will move quickly south through Leo Minor and Leo, being about 7°E of Regulus on Nov. 22. It crosses the equator on Nov. 27, and in December goes very rapidly south through Crater and into Hydra. It will be closest to the Earth on Dec. 7, but on that date its declination will be -25°, making it a very difficult object for U.K. observers and others at similar north latitudes, since it will reach the meridian only an hour before sunrise. For those observers more favourably placed it should be readily visible, since we may expect it to attain at least seventh magnitude, and may possibly be brighter. Full Moon occurs on 1980 Oct. 23, Nov. 22 and Dec. 21.

On only one occasion, in 1858, has the comet been reported to have a tail, and then it was described as "small". In 1871, 1885, 1912 and 1967 the coma was said to be "elongated" or "oval". Perhaps a few arc-minutes of tail may be seen this time, but the prospects are not encouraging. A close nodal approach can result in the observation of an anti-tail, but in the present case the geometry of the encounter is such that even if the structure existed, it could not be seen as such. The coma has rarely been reported as being more than five arc-minutes in diameter; more often the maximum size has been only two or three minutes. There is some evidence that the comet has become more diffuse than previously, and the degree of condensation of the coma should particularly be noted.

Comet Tuttle moves in an orbit almost identical with that of the Ursid meteors of December 22, and since it is at the node only four weeks before that date we might expect some enhanced activity from the shower. However, no such enhancement has been reported at previous perihelia, and the only strong occurrence of the stream on record took place when the comet was near aphelion in 1945. The shower was referred to as Becvar's stream after 1945, though he did not actually observe it that year. The radiant was well known to Denning as a minor source of meteors; he catalogued it in 1922 and suggested the connection with P/Tuttle in 1923. Sekanina has pointed out that many comets associated with meteor streams are of an active nature, but no particular unexpected variations have been reported for P/Tuttle. Perhaps the comet has settled down to a respectable old age after a more tempestuous youth, leaving its meteoric progeny to distance themselves from their putative parent.

TABLE I

TUTTLE'S COMETS

Designation	Name	Period (years)	Remarks
1858 I	P/Tuttle	13.7	Associated with Ursids
1858 III	P/Tuttle-Giacobini-Kresak	5.6	Experienced outbursts 1973
1858 VIII	Tuttle	-	Near-parabolic
1861 III	Tuttle	-	Near-parabolic
1962 III	P/Swift-Tuttle	120	Associated with Perseids
1866 I	P/Tempel-Tuttle	32.9	Associated with Leonids

H.B. Ridley,
West Chinnock,
1980. October 10

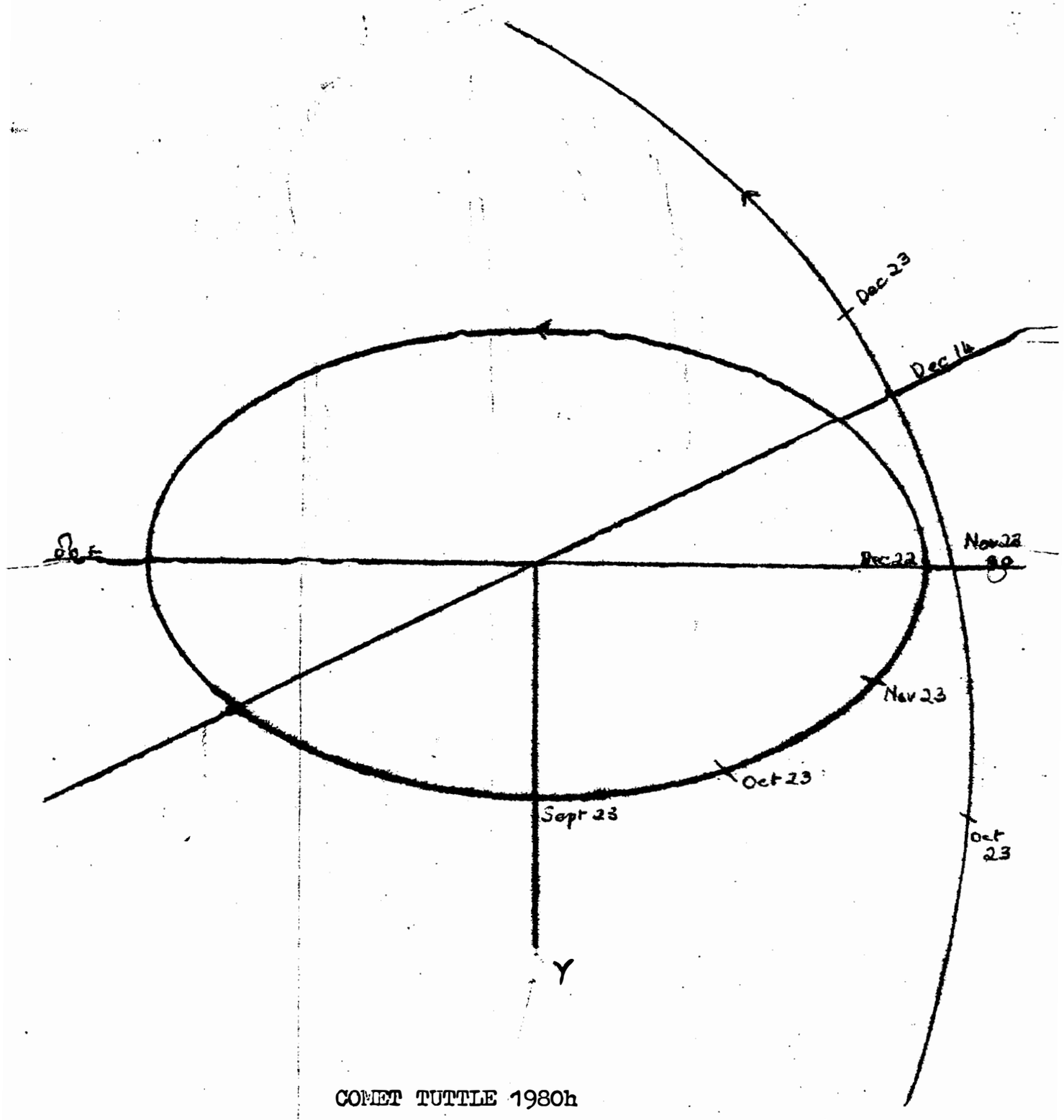
TABLE II

APPARITIONS OF COMET P/TUTTLE

Designation	T	q	e	P years	Peri o	Node o	i o	Prov. desig.	Date at Desc.node	Brightest obs. mag.	H_{10}
1790 II	1790 Jan.31.3	1.045	0.819	13.9	207.04	270.82	54.19	-	Jan.10	5 - 6	7.7
1858 I	1858 Feb.24.0	1.026	0.821	13.7	206.79	270.35	54.41	-	Feb. 3	6 - 7	7.8
1871 III	1871 Dec.2.3	1.030	0.821	13.8	206.79	270.41	54.28	1871d	Nov.11	8	8.0
1885 IV	1885 Sep.11.8	1.025	0.822	13.8	206.77	270.54	54.33	1885b	Aug.22	9 - 10	8.5
1899 III	1899 May 4.6	1.014	0.822	13.6	206.64	270.54	54.49	1899b	Apr.13	10	8.5
1912 IV	1912 Oct.29.0	1.030	0.818	13.5	206.95	270.28	55.05	1912b	Oct. 8	7	8.6
1926 IV	1926 Apr.28.8	1.031	0.819	13.5	206.97	270.13	55.00	1926a	Apr. 9	12	10.6
1939 X	1939 Nov.10.6	1.026	0.821	13.6	206.96	269.84	54.65	1939k	Oct.20	8.5	11.4
(Predicted)	1953 July 13.2	1.030	0.821	13.75	206.94	269.76	54.47	-	Jun.22	-	-
1967 V	1967 Mar.31.3	1.023	0.822	13.8	206.91	269.79	54.37	1967a	Mar.10	9	8.0
(Predicted)	1980 Dec.14.7	1.015	0.823	13.7	206.89	269.88	54.46	1980h	Nov.23	-	-

H_{10} is used by Vsekhsvyatskii, his magnitude formula being $m = H_{10} + 5 \log \mathbf{delta} + 10 \log r$

It is doubtful whether this is appropriate for a short-period comet, but I have given the corresponding figure for 1967 for purposes of comparison.



COMET TUTTLE 1980h

T	1980 Dec. 14.7431 E.T.		Epoch	1980 Dec. 27.0 E.T.	
ω	$206^{0}.8938$	1950.0	e	0.822578	
Ω	$269^{0}.8816$		a	5.720477	
i	$54^{0}.4622$		n^{0}	0.0720370	
q	1.014940		P	13.682 years	

1978a = 1977X West. Discovered by B.M. West (European Southern Observatory on 1978 Jan. 12.35 on plates taken by G. Pizarro with the 100 cm Schmidt telescope at La Silla. The comet, of magnitude 17, was moving north in Libra. On Jan 13.35 a 40 minute exposure showed a fan shaped tail 6' long between south and southwest whilst on Jan 15.34 another exposure showed a 10' long tail southward. On Jan 18.3 a 30 minute exposure with the 360cm reflector showed a spherical coma with a wide diffuse fan shaped tail 5' long southward. Magnitudes reported from February through to early April were between 15.5 and 16 but by the end of April the comet had faded to 17 magnitude and 17.4 by May 3. Prediscovery images were later identified near the edges of plates taken with the 122cm Schmidt telescope at Siding Spring on 1976 March 30, April 1 and April 2. Using these together with the 1978 observations (to June 2) a total of 44 observations, Dr. B.G. Marsden has provided the following hyperbolic elements, perturbations by all nine planets being taken into account (mean residual 1".04):

T	1977 July 21.51343 ET.	Epoch	1977 Aug. 5.0 ET
Peri.	343°.28488	e	1.0026476
Node.	210.92686 1950.0		
Inc.	116.93549	q	5.6061936 AU

(MPC 4603)

1978b - 1978XI P/Wild (2). Discovered by P. Wild (Astronomical Institute, Berne University) on 1978 Jan. 6.82 using the 40cm Schmidt telescope at Zimmerwald. The comet was of magnitude 13.5 - 14, diffuse with marked condensation and moving NW in Taurus. Although receding from the Earth, the comet was approaching perihelion and became bright enough for visual observation, magnitudes reported during February and March being around 11.5. Later, during April magnitudes were nearer 11 and May saw a number of estimates of magnitude 10.6. A short fan shaped tail was reported on occasions. The short period nature of the orbit was quickly established, the elements indicating a very close approach to Jupiter in 1974. Improved elements based on 155 observations 1978 Jan. 6 to May 9 have been calculated by Dr. B.G. Marsden, perturbations by all nine planets being included (mean residual 1".01):

T	1978 June 15.88207 ET	Epoch	1978 June 21.0 ET
Peri.	39°.87984	e	0.5566336
Node.	136.11622 1950.0	a	3.3629984 AU
Inc.	3.27494	n°	0.15981373
q	1.4910404 AU	p	6.17 yrs.

(MPC 4604)

1978c = 1978 XVII Bradfield. Discovered by W.A. Bradfield (Dernancourt, Nr. Adelaide) on 1978 Feb. 4.7, an 8th magnitude diffuse object with condensation moving NE in Telescopium. The comet brightened as it approached perihelion, attaining a total magnitude of 5.5 by the middle of March. A 25 minute exposure by M.P. Candy at Perth Observatory on March 3 showed a tail 70' long in p.a. 330° with a narrow spine 10' long in p.a. 327° and another 15' long in p.a. 337°. Visual observations of the tail were reported, 5' long soon after discovery and 8' long in mid-March. By the end of March the comet had moved too close to the Sun for further observation.

Parabolic elements based on 72 observations Feb. 6 to March 12 have been calculated by Dr. B.G. Marsden:-

T	1978 March 17.6906 ET	Peri.	48°.7131
		Node.	259.7942 1950.0
q	0.436585 AU	Inc.	51.0869

(IAUC 3233)

1978d = 1977 XIII P/Tritton. Discovered by K. Tritton (U.K. Schmidt Telescope Unit, Coonobarabran) on 1978 Feb. 11.66, a very faint object around 20th magnitude with a fuzzy nucleus and short tail moving west in Sextans. On Feb. 15.28 an exposure by C.Y. Shao (Harvard Observatory) showed a very well condensed coma with a tail 10' - 15' long. The comet remained a very faint object and only 7 precise positions were obtained (Feb 11 - March 14). Using these, Dr. B.G. Marsden provides the following elliptical elements, remarking that there is an uncertainty of about a month in the period:

T 1977 Oct. 28.61146 ET

Peri.	147°.71709	e	0.5801476
Node.	300.01199 1950.0	a	3.4261662 AU
Inc.	7.03469	n°	0.15541446
q	1.4384840 AU	p	6.34 yrs

(MPC 4603)

1978e = 1978IX P/Tsuchinshan (1). Recovered by J.H. Bulger on 1978 Feb. 4.05, a confirming plate being obtained on Mar. 8.04 by G. Schwartz and C.Y. Shao (155cm reflector, Agassiz station, Harvard Observatory). On Feb. 4 the image was very weak, magnitude 20 - 20.5 and on March 8 it was somewhat diffuse with condensation, magnitude about 19.5. The recovery positions indicated a correction of Delta T = -3.1 days to the prediction in the Handbook 1977.

1978f = 1978XXI Meier. Discovered by Rolf Meier (Ottawa) on 1978 April 27.08 when, using a 40cm f/5 reflector, he found a diffuse 10th magnitude object moving southward in Lynx. On May 2.9 a plate exposed by D. Sykes at Woolston showed a very strong inner coma 30" in diameter with a faint outer coma 7' in diameter and a very narrow straight spike-like tail 8' long a p.a. 9°. Also present was a much fainter broad diffuse tail 3' long in p.a. 30° - 40°. The total photographic magnitude was estimated as 8.5. Visually the comet was fainter, reports being close to 10th magnitude throughout the month of May. During June, the comet brightened to 9th magnitude and by the time the comet moved too close to the Sun in mid-July, magnitudes reported were nearer 8.5. After conjunction with the Sun, Comet Meier emerged into the dawn skies of the southern hemisphere and was observed at magnitude 6 early in November. The comet remained in the dawn twilight for a considerable time and was difficult to observe as it faded. By the time observation was possible in a dark sky the magnitude was below 10 and by late May 1979 the comet had faded to 13th magnitude.

The following elements are by Dr. B.G. Marsden and are based on 153 observations 1978 Apr. 28 to 1979 Oct. 26, perturbations by all nine planets being included (mean residual 1".0):

T 1978 Nov. 11.40931 ET Epoch 1978 Nov. 28.0 ET

Peri.	231°.40304	e	1.0008443
Node.	348.64562 1950.0		
Inc.	43.75497	q	1.1365273 AU

1978g = 1978 XXIII P/Clark. Making its first return since discovery in 1973, P/Clark was recovered by T. Seki (Geisei) on 1978 Apr. 13.60 at magnitude 18. The images were weak and faint on further plates exposed by Seki on Apr. 26.53 and Apr. 27.53. On Apr. 30.17 G. Schwartz and C.Y. Shao found the image somewhat diffuse on a plate taken through thin clouds at the Agassiz station of Harvard Observatory. The prediction in the Handbook required only a small correction of Delta T = -0.05 day.

1978h P/Giacobini-Zinner. Recovered by G. Schwartz and C.Y.Shao on 1978 Apr. 30.26 using the 155cm reflector at the Agassiz station of Harvard Observatory, a confirming plate being obtained on May 1.26. The comet appeared as a faint diffuse spot, magnitude around 20.5 and the recovery position was in good agreement with the prediction in the Handbook 1978.

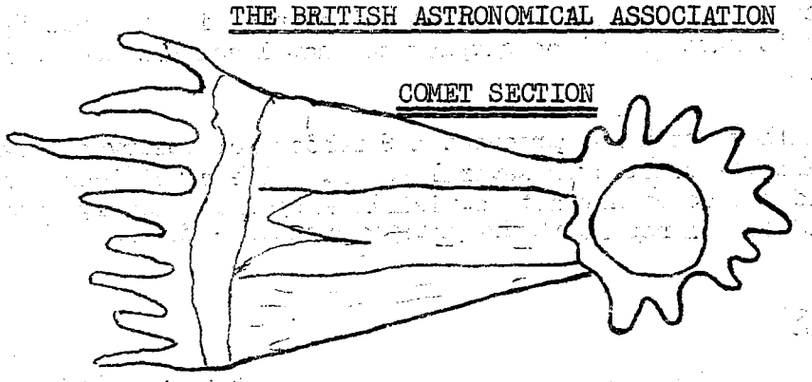
1978i P/Shan-Schaldach. Recovered by G. Schwartz and C.Y. Shao on 1978 July 2.30 using the 155cm reflector at the Agassiz station of Harvard Observatory, a confirming plate being obtained on July 3.26. The image was faint but non-stellar, magnitude 20 - 20.5. The recovery position was in very close agreement with the prediction in the Handbook 1978.

(to be continued)

S.W. Milbourn

THE BRITISH ASTRONOMICAL ASSOCIATION

COMET SECTION



ISTI MIRANT STELLA

BULLETIN NO. 15

MARCH 1981

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FROM THE DIRECTOR

The past 6 months has been a period of exceptional activity for comet observers with both periodic and new comets well-placed for observation with small telescopes from both the northern and southern hemispheres. Comet P/Encke was seen without optical aid and comet Bradfield reached 3^m or brighter with a tail 5^o or more long. But the most notable comet of the period for Section members was that discovered by Roy Panther, the first to be discovered from the UK for fifteen years and one of only six in recent times. I am sure we should like to congratulate Roy Panther for his discovery and wish him further success in the future. A brief account of the discovery and his views on instruments for comet seeking appears in this Bulletin, and his account given to a recent meeting of the Association will be appearing in the Journal.

Unfortunately owing to circumstances beyond my control, I have been unable to start on the examination and reduction of the many observations received of the several recent comets, and rather than hold up this issue longer and delay other contributions, I have reluctantly decided to hold them over until the next Bulletin. In the meantime it will be of great assistance if observers will send in their reports as soon as possible so that when a start is made shortly, the records I have will be substantially complete.

All BAA Sections have been asked to provide material for "permanent" exhibits that can be used at week-end courses and for special occasions such as National Astronomy Week in April of this year. These are intended to show in simple terms the activity of each Section, the type of work done and the use made of the results. Harold Ridley has prepared the Comet Section exhibit. On the question of exhibits, there should be no excuse for the Section not providing some new material for the Association's Exhibition Meeting in May this year, the notice for which will appear in the Journal before long. This year it will again be held at the Hawkstone Hall in London but on a Saturday (May 30th) instead of the usual Wednesday. This may make it easier for members to bring along exhibits. Smaller items such as photographs

can be sent to me by mid April, but in any case I should like to know by then what members expect to have to put on display so that I can ask the Secretary for suitable space.

The International Halley Watch has produced a Handbook for observers giving an ephemeris for Halley's comet over several years. The conditions are not very favourable, and the comet may not be visible with the naked eye from mid-northern latitudes. A report of the prospects will be included in a later Bulletin.

LIST OF OBSERVERS (3)

Observer	Location	Principal Instruments
Frydman, D.	Willesden, London Helsinki, Finland	123mm f/5 OG, 317mm f/15 Cass. 150mm f/9 Maksutov
Gilbert, Dr. C.	Newcastle-on-Tyne, Embleton	213mm f/4 refl., 138mm f/15 OG 225mm f/4 Wray Camera
Heppenstall, P.	Huddersfield (Huddersfield Astronomical & Philosophical Soc.)	400mm f/6 Refl.Two 200mm f/5 refl.
Keedy, D.R.	South Shields	75mm f/13 OG, 150mm f/20 Maksutov
Medway, K.J.	Southampton	150mm f/8 OG, 102mm f/15 OG
Southgate, B.	Whitby, South Wirral	220mm f/7 refl.

Most observers also use smaller telescopes and finders, as well as binoculars.

DESIGNATIONS OF COMETS DISCOVERED AND RECOVERED IN 1980

	Preliminary Designation & Name	Notes	Max Mag.
*	--- P/Schwassmann-Wachmann 1925 II		12
*	--- P/Encke 1786 I		6
	1980a P/Forbes		
	1980b Bowell	perihelion March 1982	10 ?
	1980c P/Honda-Mrkos-Pajdusakova		
	1980d P/Wild 3	new periodic comet	
	1980e Torres		
	1980f P/Brooks 2		
*	1980g P/Stephan-Oterma	3rd recorded apparition	8-9
*	1980h P/Tuttle	10th recorded apparition	7
*	1980i P/Borrelly		9-10
	1980j P/Kohoutek		
*	1980k Cernis-Petrauskas		10
	1980l Russell		
	1980m P/Harrington		
	1980n P/Reinmuth 2		
	1980o P/Russell 2		
	1980p ---------- (was Helin-Dunbar, withdrawn, ghost image)		
*	1980q Meier	Rolf Meier's 3rd discovery	10
	1980r P/West-Kohoutek-Ikemura		
	1980s P/Lovas		
*	1980t Bradfield	Bill Bradfield's 11th discovery	3-4
*	1980u Panther	1st discovery from UK for 15 years	8-9

* = reports received from BAA members

ROMAN NUMERAL DESIGNATIONS OF COMETS IN 1979

1979 I	Jan 9.0	P/Shajn-Schaldach	1978i
1979 II	Jan 13.7	P/Kowal 2	1979a
1979 III	Feb 12.8	P/Giacobini-Zinner	1978h
1979 IV	Feb 22.7	P/Holmes	1979f
1979 V	May 27.0	P/Russell I	1979d
1979 VI	July 15.4	Torres	1979e
1979 VII	July 23.3	Bradfield	1979c
1979 VIII	Sept 2.8	P/Schwassmann-Wachmann 3	1979g
1979 IX	Oct 17.4	Meier	1979i
1979 X	Dec 21.6	Bradfield	1979l

PROSPECTS FOR 1981

1980 was a record year for comets, and left us a good legacy: six objects that were, or may be, within range of our instruments. Only one of them is now what may be called a 'binocular comet' (9th magnitude or brighter) and three are well on the way out, but at least we have something to keep us going until the Bradfields and Panthers in our ranks turn up some new ones.

Of the seventeen periodic comets listed in the 1981 Handbook, only five remain to be recovered, and only one of these is likely to be just within our range: P/Kearns-Kwee. The following notes indicate the observing prospects (or retrospects) for this year.

1980b, Bowell This comet is now well placed in Virgo and brightening slowly as it approaches opposition. It should reach 13th magnitude this year, and may be a little brighter, but it has another year to go before reaching perihelion. Watch should be kept in case there are any outbursts, which these distant comets sometimes exhibit.

1980g, P/Stephan-Oterma This is moving slowly northeast through Auriga and will then move southeast. It is already a difficult object and may be too faint for us to observe before this article is published.

1980i, P/Borrelly This comet is making its tenth observed apparition since it was discovered in 1905 (it was missed in 1939 & 1946) but so far its track record has not been impressive; it has never been brighter than $8\frac{1}{2}$-9th magnitude, and has only once been reported to have a tail - 3' long - in 1918. In that year a very short anti-tail was also seen, but this year the Earth will not be at a node until June 7th, by which time the comet will be very faint. The practice of giving nuclear magnitudes with ephemerides means that visually a comet may be up to two magnitudes brighter than indicated, and this is the case with P/Borrelly. We may expect it to attain at least 12th magnitude, and current observations encourage the hope that it may be slightly brighter. It is now north of the equator moving up through Aries into Taurus, and it will pass close to the Pleiades, before going into Auriga. In 1932, observations with a large refractor showed a multiple nucleus, and it is a pity that visual observations with large telescopes are so rarely made now - there is no other way of seeing the finer structural features. (Some observations show it as bright as 9^m.)

1980q, Meier Moving slowly southwards in the southeast corner of Hercules this comet is fading and is badly placed for observation.

1980t, Bradfield Having given us an unexpectedly good, though brief, performance, the comet is keeping a low profile, hugging the horizon, and its elongation is decreasing. It should be followed to the last possible moment because of its reported outburst and splitting, but it is fading fast.

1980u, Panther We of the Comet Section have a special interest in this home-produced comet, and shall be able to follow it for a while as it goes northward into Draco and past the Pole, after which it will fade to $10\frac{1}{2}^m$ by early May.

1963 VIII, P/Kearns-Kwee This comet, discovered in 1963 and observed at its first return in 1971-2, may just reach 13th magnitude at the end of the year, when it will be in the northern part of Gemini.

1925 II, P/Schwassmann-Wachmann (1) This distant comet will be in Sextans during the first half of the year, reappearing after conjunction in Virgo at the end of the year. Notorious for its sudden and unpredictable outbursts, it often comes up to 12th magnitude and it is a good idea to make a routine check on it whenever possible.

H.B. Ridley

1981, February 9

THE DISCOVERY OF COMET PANTHER 1980u

M.J. Hendrie

Many readers will have been present at the January 7 1981 meeting of the Association when Roy W. Panther gave an account of the discovery of comet 1980u. This report will appear shortly in the Journal. Roy Panther has provided some additional comets on his experiences with different types of instruments for comet seeking and these are reproduced below. However, we can hardly let the opportunity pass without recording in the Bulletin the principal facts about the discovery, the first from the United Kingdom for 15 years.

The comet was detected during comet sweeping with a 20cm f/4 reflector and a power of 35 from Roy Panther's garden in Walgrave, Northampton. The night was exceptionally clear and while sweeping near Epsilon Lyrae the suspect was noticed at 18.50 UT, and at once thought to be a new comet. After checking for known comets, the NGC and several charts, and having fixed the position, Roy Panther phoned me at about 1920 UT, and so as to give me more time to try for a photograph, I asked Roy to ask George Alcock to telephone other observers likely to have clear skies, which he did. However only the east of the country was clear and the comet was getting low in the north-west. George Alcock was able to see the comet almost at once and confirmed it to Roy Panther, while I set the equatorial to the position and after ten minutes or so I could see it in the 5 inch refractor x 100 and was able to confirm the position from the circles. By the time I had loaded some film the comet was beginning to dip below the roof-line of the observatory and I had to let the telescope run unguided for 10 minutes, the camera being still clear of the roof. This exposure, timed at 20.20 UT showed the comet unmistakably and combined with the visual observations of George Alcock and myself was sufficient confirmation for Stan Milbourn to cable the IAU Central Bureau for Astronomical Telegrams in Cambridge U.S.A. which he did by 2145 UT. While this was in preparation Harold Ridley and I made a final search through old plates of the area for faint stars or nebulae but they were all without any comet-like objects near the comet's position.

It was fortunate that we had very clear skies, otherwise low altitude might have delayed confirmation for a couple of nights, the next night being cloudy. Because of the weather it was a few days before some observers could see the comet, which turned out to be quite bright at about 9^m during January - March 1981. It was a great relief personally that, given this opportunity for a discovery within the Section, nothing went wrong in the confirmation and reporting of the discovery, and that it was duly confirmed elsewhere and Panther's name attached to it. We have many false alarms but we did not expect this one to be, given Roy Panther's experience and the conditions under which it was found, and it was well worth turning out on Christmas Evening to have had a small part in claiming this discovery.

Roy Panther writes:

My tenth-magnitude comet discovery on Christmas Day 1980 was made with a 20cm f/4 reflector using a power of 35 times.

Before discovery, over six hundred hours of sweeping has been made over a period of many years. These years have seen the employment of various instruments in the task, and I would like briefly to comment on the merits or otherwise of each.

(a) 75mm Refractor x 22. Alt-azimuth mounted

Used during the early years. The eye-piece was a low power Huygenian without diagonal giving an inverted image. A wooden rod was attached to the azimuth

pillar to avoid arm fatigue during sweeping.

An adjustable chair accommodated a range of eye-piece positions. Although at the time this arrangement seemed convenient, an older observer would suffer from discomfort during an extended search.

(b) 15 x 18mm Binoculars. Alt-azimuth mounted

More convenient than the previous instrument. The eye-piece movement is minimal. The erect image enables the observer to memorize the nebula fields more easily. References to star atlases is simple as these are printed with north at the top as well. When the eye is dark adapted the amount of faint detail seen is phenomenal. The average moderately bright comet of 5' diameter is readily detected in the 4° field, although smaller ones may be missed.

(c) Large Military Binoculars with inclined eye-pieces. Alt-azimuth mounted

These instruments give greater comfort during sweeping over a moderate range of altitudes. Surprisingly high altitudes are difficult over long periods.

The greater magnification of about x25 is adequate, but there is a slight loss of contrast owing to the many prisms involved.

The fields are large, up to 75° apparent. This necessitates a large amount of eye movement to cover the field and will induce eye strain over long periods. Dewing problems are sometimes troublesome.

The wide erect field presents no problems when references are made to star atlases.

(d) 20cm f/4 Reflector x35. Alt-azimuth mounted

The field is rather small for good definition. However a large amount of faint objects are detected. Many of these cannot be memorized as the image is inverted to obtain the maximum light grasp of the telescope. Some considerable time is lost identifying these on the chart, that has to be turned upside down or at an awkward angle. An object on a corner of an atlas becomes frustrating. The instrument is comfortable to use, the eye-piece being in a horizontal position at all angles of elevation. By counter-weighting the telescope the eyepiece movement can be reduced drastically.

(e) 12cm f/5 Refractor. Alt-azimuth mounted

Used with a power of 30. A roof prism gives an erect image at right-angles to the main tube. Observing is fairly comfortable. The ability to pick out faint objects is excellent. The Veil nebula in Cygnus is very easily seen except on poor nights. To avoid bad edge of field definition the field is reduced to 2°. A given area of sky takes more time to cover than the binoculars and this is a handicap in inclement weather.

In England not all cloudless nights during the dark of the moon can be used. Many mediocre nights can be used by sweeping at higher altitudes to advantage.

ATLASES, CHARTS AND THE COMET OBSERVER

G.S. Keitch

Summary: Several good atlases are currently available and these are discussed with references to specific aspects of comet work. The atlases have not been described in detail and readers requiring further information should consult the bibliography. A facility is being considered to make charts available for observers wishing to carry out photometric work on faint comets and further ideas on this subject are requested.

Atlases can be used for the following aspects of comet work.

1) Identifying the comet by plotting its position or track.

2) Estimating the size of various features such as coma diameter or tail length, either by direct reference to the atlas scale or by the method of star separations.

3. Determining the position angle of various features, such as tails, by plotting their orientation.

4. Photometry. Comparison star identification and data relating to magnitude and spectral-type.

5. It is useful to use an atlas for the preparation of accurate field sketches.

Those involved in comet seeking will find additional value from atlases containing deep sky objects whilst certain atlases and catalogues will be essential to those involved in precise astrometric work.

The author uses several atlases for plotting the comet's position or track and the one selected for a given comet depends largely on the magnitude of the comet and the instrument to be used. Considerable accuracy will be needed to locate a tiny mag 12 or 13 comet in the 30cm spec at x142 with a field of only 20'. Conversely a bright object, which can be recognised instantly in the 7cm finder, will be located without difficulty in the main instrument or 5-8cm binoculars. It is the faint objects which present the greatest difficulty. In this situation, it is the various field stars, together with accurate plotting, which will enable the comet to be identified. The limiting magnitude of the atlas is, therefore, the important consideration. For instance, it may be possible to plot a comet's position to within several arcminutes on a given atlas but if that places the comet in a blank area of the chart simply because its magnitude limit is only $7\frac{1}{2}$, it is going to be difficult or even impossible to locate a mag 12 comet at the limit of detection. At the same time, a photographic atlas crammed with countless stars fainter than mag 10 may be overelaborate although, in the writer's experience, this would be a preferable situation.

NORTON'S STAR ATLAS with a limiting mag of around 6 is of limited value. Far better is the ATLAS OF THE HEAVENS (ATLAS COELI) by A. Becvar which goes down to mag 7.75. This atlas in the deluxe format, is supplied with a transparent grid which allows the position to be plotted with ample accuracy for binoculars or small finders. For easily recognised comets brighter than about mag 8 this is a good atlas. Many deep sky objects brighter than about 12^m are included on the sixteen charts which cover the whole sky and it has become a standard reference for comet hunters. The same atlas in reduced size format (18" x $12\frac{1}{4}$") is available in a 'Field Edition' or 'Desk Edition'. The latter, where stars are portrayed as black spots on a white background is very suitable for use in the field, whilst the true 'Field Edition' (white stars) is less useful as one cannot scribble over a black background. The 'Desk Edition' charts are very durable and represent very good value for money.

A number of charts go down to about mag $9\frac{1}{2}$, for instance, the SMITHSONIAN ASTROPHYSICAL OBSERVATORY STAR ATLAS (SAO). This is now out of print although the new AAVSO VARIABLE STAR ATLAS is essentially a remake and improved version of the SAO atlas. The new atlas, at a scale of 1mm = 4' contains about 260,000 stars brighter than 9.5 and many deep-sky objects on 178 12" x 14" charts. The real value of this new atlas will be discussed further on in this article. Two other atlases with similar limiting magnitudes are the ATLAS BOREALIS and ECLIPTICALIS. These do not contain deep sky objects and the charts are too large and bulky for use at the eyepiece.

For telescopic work, the writer much prefers photographic atlases such as those produced by Hans Vehrenberg. A good choice is the ATLAS FALKAUER which has a limiting photographic magnitude of 13. It shows most of the stars within the reach of a 20cm telescope whilst the ATLAS STELLARUM, which goes to mag 14, would be even better for users of 25 and 30cm instruments. The writer uses the Falkauer but the Stellarum's larger scale and fainter limit would be better for the 30cm spec at Wrington. The Vehrenberg atlases have transparent overlay grids which permit a plotting accuracy of approx 1 arcmin with care. On some of the charts, the guide marks for lining up the grid are out by several arcmins and if the atlas is to be used for semi-precise positions, the accuracy of the grid in the area of the comet should be checked against a nearby SAO star. Any necessary corrections can then be applied. The Vehrenberg atlas is a very useful aid when observing very faint difficult comets, not only because it facilitates a reasonable plotting accuracy but

because it provides a realistic representation of the sky making it so much easier to locate the correct field. With such an atlas, one can soon perfect the art of 'star-hopping'. Quite often it is necessary to locate a reasonably prominant star in the finder and then hop through several degrees of the sky with the main instrument in order to arrive at the correct spot where the comet should be. The handy Vehrenberg charts ($11\frac{1}{4}$" x $8\frac{1}{4}$) are ideal for this. The atlas is also invaluable for confirming that the object under observation truly is the 12th or 13th mag comet and not a faint 13th mag star, faint double or obscure deep sky object.

Recently the new TRUE VISUAL MAGNITUDE PHOTOGRAPHIC STAR ATLAS by C. Papadopoulos has attracted considerable interest. One disadvantage of the Vehrenberg charts is that they were made on blue sensitive plates and do not represent the true visual impression. In the field this is not objectionable but if one were to use the charts for estimating the visual mag of comparison stars, the values would be most unreliable. In this respect the Papadopoulos atlas would be more useful, although it must be said that only accurately known magnitudes ought to be employed for serious photometry of the coma. Accurate magnitudes for comparison stars are a real problem and this is considered in more detail later in this article.

Atlases can also be used to reduce the actual observations. J. Bortle[1] and C. Morris[2] have independantly reviewed the procedures for observing comets and each have suggested a number of techniques for estimating coma diameter and tail length. The method of particular interest for this article involves the use of a good atlas. The coma diameter or tail length is compared with the separation of two suitable field stars and is recorded in the following way.

Coma dia = $\frac{1}{2}$ xy. Tail length = 3 xy, where xy is the separation of two comparison stars, x and y as measured from a suitable atlas. Firstly, let's consider coma diameter. Both Nortons and Atlas Coeli do not show sufficient comparison stars simply because of poor limiting magnitude. Consequently this method cannot be used properly with these two atlases. More suitable, are the various atlases already mentioned, which go down to mag $9\frac{1}{2}$. With these, the method can be used providing the observer ensures that the stars selected at the eyepiece are sufficiently bright to be included on the charts. There are plenty of 'doubles' on the Eclipiticalis atlas with separations of around 10'. Although the eye is surprisingly capable at estimating fractions one ought not to estimate in fractions smaller than about $\frac{1}{4}$ as the accuracy will be dubious. Assuming therefore that a typical 'double' of 10' separation has been selected from the Eclipiticalis, the method should be suitable for coma diameters greater than about $2\frac{1}{2}$'. This essentially accords with Morris' suggestion that with an atlas such as Eclipticalis, the method works best for comets of medium to large size (coma dia > 3')[3]. The photographic atlas is far superior for this method and there are countless numbers of faint stars with 4' separations in the Falkauer Atlas which enable reasonably accurate estimates of coma diameters barely 1' in size. To measure the separations accurately, the writer examines the chart with an old eyepiece coupled with an ex-Govt graticule, as the scale of 1mm = 4' is a little small for precise work. There are other methods of course for determining the coma diameter such as the drift method or use of a reticle eyepiece but generally, the writer prefers the method of star separations, especially when using averted vision on a very diffuse object when the boundaries of the coma are very poorly defined. The writer finds it easier to retain the impression of a vague object when comparing it to the separation of two stars rather than concentrating on timing the drift over a crosswire or counting the divisions on a reticle, although not all observers will agree with this. Several estimates should be made using various comparison stars and the mean value taken.

Tail lengths can be measured in a similar fashion but if the tail is of significant length, i.e. >10' if a photographic atlas is used or >20' for other atlases, it is better to plot the tail on to the atlas directly and measure the length using the scale of the atlas. Chart distortion due to mapping projection effects is significant for tail lengths over 10° (!) and when this situation is encountered it is necessary to plot the RA and Dec of the tail's beginning and end points so that the following formula can be applied.

$$\cos l = \sin \delta_1 \sin \delta_2 + \cos \delta_1 \cos \delta_2 \cos (a_1 - a_2)$$

where 1 is the tail length, a_1 and δ_1, are the right ascension and declination of the comet's head and a_2 and δ_2, the corresponding RA and dec of the tail's end, with all values expressed in degrees.

It is desirable to measure the position angle (PA°) of the tail or any other features and this again can be achieved with the aid of an atlas. The features are plotted on to a good atlas and a protractor is all that is needed to measure the PA. Care must be taken to align the protractor correctly so that 0° points due north. With the large number of faint stars on the Falkauer atlas, one can trace out the tail amongst the background stars very accurately. In this connection it is worth mentioning that it is very useful to prepare a good field sketch of the comet and its principle features. This enables one to identify any comparison stars and, if a tail is present, the details can be transferred on to an atlas for the measurement of PA. If a complex sketch is anticipated, it is helpful to prepare the principle layout of the background stars from a good atlas beforehand. Often comet tails are so faint as to be little more than glimpsed and trying to draw an accurate field sketch at the eyepiece only adds to the difficulties and errors. At least if the principle stars have been precisely drawn in before hand one can concentrate on recording the exact positions of those extremely faint whisps of material that stream away from the coma. Less artistic observers would certainly benefit from using predrawn fields at the eyepiece.

Finally, photometry of the coma is one of the most important aspects of the observing programme and in this respect, atlases and charts are essential for the identification of suitable comparison stars. The Coeli, Eclipticalis, Borealis and SAO atlases all have the star images graded according to bands of magnitude and consequently can be used to give a rough indication of magnitude but they are not adequate for precise photometric reductions. Similarly, the Vehrenberg atlases can be useful to give rough indications of magnitude when one is dealing with stars near the limit of the chart providing the chart's limiting mag can be ascertained but, as already stated, the charts are blue sensitive and are not suitable for precise work. The new photovisual Papadopoulos charts ought to be more usable in this respect although S. Dunlop, in his review of the atlas, appears to have some reservations about this (4). Accurate visual magnitudes are required and the new AAVSO atlas is a welcomed addition to the choice of available references. It contains magnitudes for numerous stars taken from AAVSO Fields and Fields used by the RASNZ. The atlas, which is based on the SAO charts goes down to approximately mag $9\frac{1}{2}$ and has magnitudes for a good number of stars down to this limit and sometimes below. Together with a 20 x 80 binocular, this atlas would make a nice package for those wishing to follow the brighter comets, i.e. those brighter than mag 9. The AAVSO atlas is the only one currently available which lists magnitudes by selected stars, although the catalogues which accompany the Coeli and SAO atlases list magnitudes. In the case of the former, magnitudes are given for stars down to about $6\frac{1}{2}$ whilst the latter is a mammoth four volume work with thousands of magnitudes for stars sometimes as faint as mag 10. Unfortunately, the visual magnitudes listed in the SAO are often rather dubious, especially those listed for stars fainter than about mag $7\frac{1}{2}$. The new AAVSO Atlas would be a preferable choice although the precise positions and spectral-type data given in the SAO catalogue are still very useful. Incidently, the Eclipticalis and Borealis atlases have the stars coloured according to spectral-type and at a glance, one can see instantly which orange, red and variable stars are to be avoided as comparison stars.

For the photometry of comets fainter than 9-10, the observer's only source of magnitudes will arise from specific sequences, principally V.S. fields. Others do exist, for instances the N.P.S. and Pleiades. Serious comet observers must have access to such sequences and it is an important priority that links of communication are established between comet observers and V.S. groups such as the BAAVSS and AAVSO. The writer has been asked to look into this problem on behalf of the Comet Section. At the present time, a specific facility or arrangement has yet to be worked out but ultimately, the Section should have its own collection of charts. To compile a complete collection of V.S. charts for the whole sky would be a mammoth undertaking by all accounts so the writer proposes to concentrate on those charts which contain stars fainter than the mag 9-10 limit of the AAVSO. Any serious observer will probably acquire the AAVSO atlas so the priority must lie with the magnitudes for very faint comparison stars. Observers in this country are unlikely to look at mag 11 and 12 comets at altitudes of less than about 20° so any fields which fail to attain

this altitude can be ignored for the time being. The number of charts remaining should therefore be reduced to more managable proportions, i.e. those with stars fainter than mag 9-10 which reach altitudes in excess of 20° from our latitudes. The writer is currently discussing the problem with Mr. S. Dunlop of the BAAVSS who has put forward a number of helpful suggestions including the possibilities of producing sequences for specific comets using photoelectric and photographic facilities. The possibilities of distributing charts to everyone are completely ruled out on the grounds of cost and bulk. A workable system would probably revolve around a central file of charts. Observers wishing to follow a particular comet would request the appropriate charts and these would be duplicated and issued accordingly. As very few observers follow the fainter objects, the number of charts to be issued at any one time is unlikely to exceed more than half a dozen. In time, enthusiastic observers would build up a reasonable chart collection of their own and will probably have less call to use the facility. The facility will, however, still serve a useful purpose for newcomers. Further consideration must be given to this subject especially now the Section submits observations to the ICQ. Members of the Dutch Comet Group have their own charts prepared which show the comet's track through the sky with suitable comparison stars included. The writer shortly hopes to meet up with H. Feijth and P. Bus who are involved with the Dutch group and an exchange of ideas on this subject will hopefully take place. Any other observers with ideas to contribute should contact the author at the address given below.

Bibliography:

Larson W.J. Sky and Tel 56, 507 'Some selected sky charts for the amateur.'

Scovil C.E. Sky and Tel 60, 99 'The AAVSO Variable Star Atlas'

Dunlop S. JBAA 91, 191 Review: 'True Visual Magnitude Photographic Star Atlas'

The various atlases referred to in the text can be obtained from most suppliers of astronomical books. Some are available at discount prices to members of the Junior Astronomical Society.

References:

1) Bortle J.E. Sky and Tel. 61, 210 (1981)

2) Morris C.S. International Comet Quarterly 3, 3 (1981)

3) Morris C.S. op cit

4) Dunlop S JBAA 91, 191

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COMETS IN 1978 (Cont)

1978j = 1978 XX P/Haneda-Campos. Discovered independently by Toshio Haneda (Haronomachi) and Jose de Silva Campos (Durban) on 1978 Sept. 1.52 U.T. and Sept 1.88 U.T. respectively. The comet was well south of the equator in Microscopium, diffuse without tail and of magnitude 9-10. Prediscovery images were later found on plates taken at Perth, Palomar and the European Southern Observatory. The comet remained close to 10th magnitude for a time before fading and becoming very diffuse. By the end of September the magnitude had dropped to 12.5, 15 by the end of October and 17 by the middle of November.

Elliptical elements have been calculated by Dr. B.G. Marsden based on 24 observations 1978 Aug. 9 - Nov. 8. Perturbations by all nine planets have been applied, the mean residual being 1".24 (MPC 4604):

T 1978 Oct. 9.49608 ET			Epoch 1978 Oct. 19.0 ET
Peri.	240°.43613		e 0.6651698
Node	131.58618	1950.0	a 3.2894375 AU
Inc.	5.95060		n° 0.16520440
q 1.1014030 AU			P 5.97 yrs.

These elements imply approaches to Jupiter of 0.3 - 0.4 AU in 1957 and 1969.

1978K = 1978 XXII P/Giclas. Discovered by H.L. Giclas (Lowell Observatory on 1978 Sept. 8.30 U.T., a 15.5 magnitude object diffuse with condensation moving slowly south in Cetus. The comet remained around 15 - 16th magnitude for a time before fading. The orbit proved to be of short period and the following elliptical elements have been calculated by Dr. B.G. Marsden using 40 observations 1978 Sept. 14 - Nov. 20, no perturbations being applied (MPC 4604):

T 1978 Nov. 21.25039 ET			
Peri.	247°.24997		e 0.5118850
Node	141.53454	1950.0	a 3.5474457 AU
Inc.	8.54320		n° 0.14751305
q 1.7315615 AU			P 6.68 yrs.

1978l = 1978 XIII Machholz. Discovered by Don E. Machholz (Los Gatos, California) on 1978 Sept. 12.51 U.T. using a 25cm reflector. The comet was of magnitude 11, diffuse with condensation and moving south in Canis Major. The comet moved swiftly southwards and remained a diffuse object of around magnitude 10.5 - 11 for a month before fading. Dr. B.G. Marsden provides the following parabolic elements based on 25 observations 1978 Sept 14 - Nov. 20, no perturbations being applied (MPC 4604):

T 1978 Aug. 13.64897 ET		Peri.	224°.74733
		Node	289.98257 1950.0
q 1.7714345 AU		Inc.	130.63422

1978m = 1978 XV Seargent. Discovered by D.A.J. Seargent (The Entrance, NSW) on 1978 Oct. 1.78 U.T. when he found a 5th magnitude comet moving south in Centaurus. The comet was diffuse with condensation and had a tail approximately half a degree long in p.a. 200° (D. Herald, Oct. 2). The comet moved rapidly towards the southern pole and began to fade, B. Summer (Perth) reporting a magnitude of 6.4 and a tail 2° long in p.a. 180° on Oct. 3. By early November, Comet Seargent had faded to mag. 8.5.

A general solution by Dr. B.G. Marsden based on 23 observations 1978 Oct. 2 - Nov. 29 shows a significant departure from parabolic motion (MPC 4604):

T 1978 Sept 14.84872 ET		Peri.	207°.75182
e 0.9982690		Node	41.08209 1950.0
q 0.3698716 AU		Inc.	67.81974

1978n = 1978 XIX P/Denning-Fujikawa. An 11th magnitude comet found by S. Fujikawa (Onoharo, Kagawa) on 1978 Oct. 9.81 U.T. was at first thought to be a new comet but as observations accrued it became clear that it was identical with the long lost comet P/Denning 1881 V. The comet was very diffuse without condensation although a plate obtained at the Harvard Observatory's Agassiz station on 1978 Nov. 2 showed a tail 1'.0 - 1'.5 long in p.a. 300°.

The following elements by Dr. B.G. Marsden are based on 15 observations 1978 Oct. 10 - Nov. 9 and are not linked with 1991 V (MPC 4605):

T 1978 Oct. 2.13756 ET			
Peri.	334°.25630		e 0.8210242
Node	40.89678	1950.0	a 4.3551724 AU
Inc.	8.64648		n° 0.10844163
q 0.7794706 AU			P 9.09 yrs.

1978o = 1978 XVII Bradfield. Another Bradfield discovery came on 1978 Oct. 10.78 U.T. when he found a 9th magnitude diffuse comet with condensation moving SSE in Crater. Preliminary elements showed that the comet was past perihelion and expected to fade and by Oct. 24 the magnitude was down to 10.5 (D. Herald, Kambah). In Nov. 20, T. Seki (Geisei) reported the magnitude as 16. This appears to have been the last observation and the following parabolic elements by Dr. B.G. Marsden (MPC 4605) are based on 8 observations 1978 Oct. 11 - Nov. 20:

T 1978 Sept. 29.08814 ET	Peri.	240°.44977	
	Node	357.72021	1950.0
q 0.4318697 AU	Inc.	138.25839	

1978p = 1978 XVI P/Tsuchinshan (2). Recovered by T. Seki (Geisei) on 1978 Oct. 29.82 U.T., the comet being very faint at magnitude 18 and diffuse with condensation. This was the third appearance of the comet, first discovered in 1965 and the prediction in the Handbook 1978 was very close, Delta T being less than 0d.01.

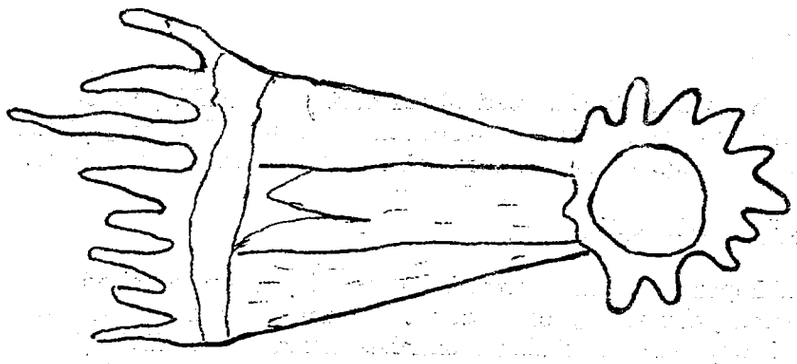
1978q = 1978 XXVI P/Jackson-Neujmin. Recovered by C.T.Kowal (Hale Observatories) on 1978 Nov. 28.12 U.T. using the 122cm Schmidt telescope at Palomar. The comet was diffuse with little condensation and of magnitude 19.5. P/Jackson-Neujmin, discovered in 1936, was lost until 1970 and the prediction in the Handbook 1978 for this the third observed appearance required a correction of Delta T = +0d.77.

1978r = 1978 XXV P/Tuttle-Giacobini-Kresak. Making its sixth observed appearance since Tuttle originally discovered it in 1858, this comet was recovered by T. Seki (Geisei) on 1978 Nov. 8.84 U.T., confirming plates being taken on Dec. 11. On Nov. 8 the magnitude was 17 but the Dec. 11 plates showed a large diffuse coma of magnitude 15 with the possibility of a short tail. No reports were made of large surges in brightness such as occurred in 1973. The prediction in the Handbook 1978 required a small correction of Delta T = +0d. 10.

S.W. Milbourn

THE BRITISH ASTRONOMICAL ASSOCIATION

COMET SECTION



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FROM THE DIRECTOR

I am pleased to be able to include in this issue reports of 3 recent comets. To speed up the analysis and publication of the results of members' observations some organisational changes have been made and below you can find a table showing the special interests and responsibilities of Section officers. In particular separating the work on current and historical observations will enable progress to be made on more recently observed comets without holding up analysis of the older observations. After the hectic activity of last autumn and winter, there are still no comets within the reach of amateur instruments at the time of writing. However, you will see from the table that the Section is far from dormant at such times! News of some recent activities and others forthcoming are given below.

AWARDS

It is a pleasure to record that for the second successive year the Association's Merlin Medal has been awarded to a member of the Section. Roy Panther was awarded this medal for more than thirty years comet seeking and observing and especially for his discovery on Christmas Day 1980 of comet Panther 1980u.

Also in this session George Alcock was awarded the Amateur Achievements Award of the Astronomical Society of the Pacific, mainly for his work on comets and novae. We congratulate him also.

SECTION MEETING

We are trying to arrange a Section meeting for a Saturday in April 1982 (probably 17th or 3rd) in London. After a review of the amateurs place in cometary astronomy the meeting will be mainly concerned with the improvement of observational methods and reporting, and the means of bringing this about. Further information will appear in the March Bulletin and February Journal. N.B. The Meeting has been fixed for 1982 April 17.

SECTION OBSERVATIONS 1947 - 1955

Analysis of some 1200 observations of all comets observed by the Section between 1947 and 1955 is in hand. Charles Morris and Michael Hendrie are

working jointly on these observations and will be preparing a paper for the Journal summarising the results. The observations will also be available for the ICQ files.

INTERNATIONAL HALLEY WATCH

Planning for the IHW, the co-ordinated observation of Halley's comet from ground and space-base instruments is proceeding at the Jet Propulsion Laboratory. It is hoped to have more information in the March Bulletin.

VISUAL PHOTOMETRY-OBSERVING METHODS

The recent Section Report in the Journal on Comet Kohler touched on the difficulties of visual photometry of comets. Work is well advanced on a paper by Graham Keitch, Harold Ridley, Charles Morris and Michael Hendrie on the methodology of making magnitude observations and analysing the results. We hope that this will go a long way towards providing the framework within which observers can improve the usefulness of their observations by the standardisation of methods and use of standard comparison stars.

COMETS PASSING CLOSE TO THE EARTH

We have provided Joe Marcus, Editor of Comet News Service (Cincinnati, USA) with observations of comet Burnham 1960 II (1959k). This comet passed close to the Earth (19 million miles) in April 1960 just reaching naked eye brightness, but faded very quickly, the light-curve steepening suddenly. Comets passing 'close' to the Earth reach large angular diameters posing problems for the accurate determination of their total brightness.

ACTIVITY IN COMETARY HEADS AND NUCLEAR MAGNITUDES

Professional astronomers are very interested in the cometary nucleus, rarely seen directly by amateurs with small telescopes. Studies have been made of the fans, hoods and envelopes in the heads of some comets and sudden changes of brightness, as a means of determining the rotation period of the nucleus.

Dr. F.L. Whipple kindly sent an advance copy of a paper stressing the importance of observing these features when they appear. Paul Doherty and Michael Hendrie are looking at the implications of this for our observers, especially those with the larger telescopes and we shall be drawing up some guidelines on what is required and how best to make use of such opportunities when they occur. We expect to include something on this subject in the next Bulletin.

COMET P/KEARNS-KWEE 1981 h

This comet often displays a well-condensed appearance making it brighter in smaller instruments than the m_2 values in the Handbook suggest. The comet is favourably placed this autumn and may be accessible as a faint object to photographers and those with larger visual telescopes. None of the other 9 comets discovered and recovered this year so far is likely to be visible with amateur equipment.

DUTCH COMET SECTION

During April Henk Feijth (Recorder) and Peter Bus (Secretary) of the Dutch Comet Section (Werkgroep Kometen van de Nederlandse Vereniging voor Weeren Sterrenkunde (NVWS) visited the UK and several members of the Section including Graham Keitch, Harold Ridley and the Director were able to meet them and discuss problems of mutual interest.

They left us copies of their excellently produced publication "Rapport van de Werkgroep Kometen" which gives physical and photometric parameters for 15 comets from 1968 to 1981 based on over 500 observations made by their members. This report is in English as well as Dutch. We also receive the regular bulletin "Kometen Nieuwsbrief" which is duplicated and rather like our Bulletin: this is printed in Dutch only (but the numbers are in English!) We agreed to co-operate in the exchange of information and publications, developing charts for magnitude sequences along comet paths, exchange of

photographs of special interest and in contacts with other groups in Europe. During their stay they travelled long distances to meet us and we hope that they enjoyed their visit, which was during National Astronomy Week. (Detailed points discussed will be available at the Section Meeting.)

INTERNATIONAL COMET QUARTERLY

During June we had a visit from Charles S. Morris, Associate Editor of ICQ. Charles Morris is also a member of the BAA and of the Comet Section, and it is he who receives observations sent to the ICQ for publication and filing.

During his two week visit he stayed with several BAA members including Graham Keitch, Ron Arbour, Guy Hurst and the Director and met several other comet observers at their homes. He also gave a very interesting talk to the BAA June meeting at Savile Row on his travels to Japan and around the USA. In Japan he met many discoverers of comets and showed slides of their instruments and observatories.

While visiting the Director and later Graham Keitch we had long discussions on observational problems especially relating to ICQ requirements for standardised photometric and physical data reporting. We also agreed on the writing of a joint paper on methods, and future areas of co-operation included investigations into cometary atmospheric extinction factors, further work on aperture correction factors, standard stars for photometry especially for comet Halley, and analysis of BAA observations reported above. The need to improve the standard of visual total magnitude observations and their analysis was stressed and the intended publication of guidelines and new "Observers Notes" should help here. The problem is worldwide and the BAA observations compare well in many cases with others made elsewhere, but many observers have not had all the guidance they could benefit from, a situation we hope to rectify.

Apart from the immediate advantages of our discussions, it is always a good thing to meet those with whom you are working and I think we all found our discussions with Charles very helpful and they should make co-operation between the ICQ and BAA easier and more valuable in the future. (Specific points discussed will be available at the Section Meeting.)

BRITISH ASTRONOMICAL ASSOCIATION - COMET SECTION - ORGANISATION 1981

1.	Administration	Membership records, new members, general queries, reports to Council and expenses accounts, Section meetings, program development and implementation	MJH
2.	Publications/Reports	Reports to BAA meetings, copy for BAAC	MJH
		Bulletin:	
		Editing	MJH
		Production and despatch	SWM
		Notes on orbits and apparitions	SWM
		Current BAA comet observation reports	GSK
		Notes from IAUC, other Journals etc	HBR/MJH
		Papers in JBAA:	
		Analysis & writing	PBD/GSK/HBR/MJH
		Artwork & diagrams	PBD
		Exhibitions:	
		Permanent BAA & Courses	HBR
		Artwork etc.	PBD
		BAA Annual Exhibition Meeting	HBR/MJH
		Notes on observing : revision/expansion*	HBR
		Notes for New Members etc.	HBR/MJH
3.	Observations:		
	Physical/Photometric		
		Current: Receipt & initial record	MJH
		Mag. reduction & physical development	GSK
		Photometric analysis	GSK/MJH
		Reporting to ICQ (copy to MJH)	GSK
		Reports to Bulletin	GSK
		Reports to JBAA	GSK/HBR/MJH

Continued over

3. Observations (continued)

Physical/Photometric

Current: Charts, mag. sequences, standard photometric procedures	GSK
Head & Tail-fine details recording	PBD/MJH
Historical-BAA observations from archives: Analysis & reporting (some with ICQ)*	HBR/MJH

Photographic & Astrometric

Advice, new materials & methods	HBR/MJH
Astrometry-to be developed	SWM/HBR/MJH

"New Comet" Confirmations

Co-ordinator/deputy in absence	MJH/HBR
Liaison & communication with IAUBureau	SWM

4. Computing

Receipt of accurate positions & advice	SWM
New & revised orbits & ephemerides	SWM
General advice on computing in Section	SWM
Data handling, admin. & physical data etc.	MJH

5. Research

New methods, hypersensitising etc.	HBR/MJH
Photoelectric photometry appraisal	HBR
Cometary extinction factors & instrumental correction factors*	GSK/MJH

6. Special Projects

Visual Photometry Methodology paper* for JBAA (joint BAA/ICQ)	GSK/HBR/MJH
Guidelines for drawings/measures in cometary heads and nuclear mags.*	PBD/GSK/MJH
International Halley Watch-liaison & organisation	MJH

* In association with C.S. Morris of ICQ (International Comet Quarterly)

MJH: M.J. Hendrie, SWM: S.W. Milbourn, GSK: G.S. Keitch, HBR: H.B. Ridley, PBD: P.B. Doherty.

A FEW NOTES FROM OTHER JOURNALS

by G. J. HODGKINSON

Occasionally there are reviews in journals of other fields of research that by introducing a new topic (astronomy) they often present a concise view by way of introduction. Such a paper recently appeared in Accounts of Chemical Research[1]. There is a two page introduction/summary of cometary phenomena (appearance, formation of tails etc.), before discussing some of the chemical processes occurring within them. One problem in the understanding of these processes is that although over thirty chemical species have been observed in comets the identity of the parent molecules is not known.

Chemical species observed in comets:

neutral species:	C	C_2	C_3	CO	CS	CH
	CN	HCN	CH_3CN	O	OH	S
	N	NH	NH_2			

Continued over

Chemical species observed in comets (continued)

Metals	Na	K	Ca	Mn	Cr	V
	Fe	Ni	Co	Cu	Al	
Ionised species:	C^+	CO^+	CO_2^+	CH^+		
	DH^+	H_2O^+	Ca^+	N_2^+		

Of other articles, it has been suggested that the comets are older than the most primitive meteorites[2] (C1 chondrites), and changes in the orbital period of Comet Encke may be due to changes in its activity.[3] The rotation of an icy nucleus may bring an active area to face the sun, and the evaporation of material from the active area may change the orbital velocity. Another consequence of this activity is the development of a series of concentric halos (hoods). Comet Donati 1858 being cited as the most conspicuous example. From measurements of such features in Comet Encke it was possible to derive a rotation period of $6\frac{1}{2}$ hrs.

References:

1. Oppenheimer, M., Accounts of Chemical Research, 13, 378-384 (1980).
see also:
Michel, K.W., Sterne Weltraum 19 (7-8), 239 (1980),
Mitchell, G.F., et al., Astrophys. J. 244, 1087 (1981)
for other papers on comet chemistry.

2. Delsemme, A.H., Life Science Space Research 18, 3 (1980) and
Applied Optics 19 (23), 4007 (1980).

3. Whipple, F.L., Scientific Amer., 242, 88 (1980).
For a more recent paper see Ip, W.H., Nature (London), 289, 269 (1981)

COMETS IN 1979

1979a=1979 II. P/Kowal(2). Discovered by C.T. Kowal (Hale Observatories) on 1979 Jan. 27.11 U.T. using the 122cm Schmidt telescope at Palomar. Confirming plates were obtained on Jan 28.12 and Jan 29.27 U.T. The comet was diffuse with only slight condensation and without tail, magnitude 17. By late March the comet had faded to mag. 18 and had become very diffuse making measurement of position very difficult, the last observation being by C.-Y. Shao (Agassiz) on Mar. 28.08 U.T.

From soon after discovery it was recognised that the comet was a new short period object and the following elements are by Dr. B.G. Marsden and based on 11 observations 1979 Jan 27 - March 28 (MPC 4772).

T	1979 Jan. 13.74006 ET			
Peri.	189°.38010		e	0.5637970
Node	247.16312	1950.0	a	3.4866697 AU
Inc.	15.80708		n°	0.15138675
q	1.5208957	AU	P	6.51 yrs.

1979b=1978 XII. P/Daniel. Recovered by P.R. Standen using the 122cm Schmidt telescope at Siding Spring on 1979 Feb. 2.69 U.T., a confirming plate being obtained on Feb. 7. The comet was well condensed but without tail, mag. 19. The recovery was effected by means of an ephemeris supplied by A. Pickup (Royal Observatory, Edinburgh) from the prediction by Dr. B.G. Marsden on IAUC 3219, the agreement with the recovery positions being very close. It

was thought that the comet was impossibly placed at this apparition and no prediction appeared in the Handbook, but eventually P/Daniel was recovered at a record distance, 7 months after perihelion.

Originally discovered in 1909, this is the 6th recorded appearance.

1979c=1979 VII. Bradfield. Discovered by W.A. Bradfield (Dernancourt, nr. Adelaide) on 1979 Jun. 24.42 U.T. Of magnitude 10, the comet was diffuse without tail. Comet Bradfield brightened for a time as it approached perihelion and reached a peak of around mag. 8.5 in early August. A rapid decline then set in and by early September it had faded to mag. 11 and to 18 by the end of the month.

Dr. B.G. Marsden has calculated slightly hyperbolic elements based on 18 observations 1979 Jun. 25 - Sept 24 (MPC 5031):

T	1979 Jul. 23.26258 ET			
Peri.	47°.64950		e	1.0000585
Node	163.51651	1950.0		
Inc.	136.23567		q	0.4132170 AU

1979d=1979 V. P/Russell(1). Discovered by K. Russell (U.K. Schmidt Telescope Unit) on a plate taken by P.R. Standen using the 122cm Schmidt telescope at Siding Spring on 1979 June. 16.44 U.T. The comet was diffuse with condensation, magnitude 17, and had a suggestion of a tail. Observations were continued only until August 14, but later a prediscovery image was found on a plate taken with the U.K. 122cm Schmidt on 1979 Feb. 27.71 U.T. Using this observation together with 8 others 1979 Jun. 16 - Aug 14, Dr. B.G. Marsden obtained the following elliptical elements, perturbations by all nine planets being taken into account (MPC 5639):

T	1979 May 26.97918 ET		Epoch 1979 May 7.0 ET	
Peri.	0°.22932		e	0.5168219
Node	230.17649	1950.0	a	3.3392236 AU
Inc.	22.65315		n°	0.16152354
q	1.6134398 AU		P	6.10 yrs

1979e=1979 VI. Torres. Discovered by C. Torres (National Observatory, University of Chile) on 1979 Jun 26.25 U.T. Diffuse with condensation but without tail and of magnitude 18, the comet remained a very faint object and was followed only until October 23. Two prediscovery images were later found on plates taken with the U.K. 122cm Schmidt on 1978 Aug. 23 and Aug. 26.

Using 29 observations 1978 Aug. 23 - 1979 Oct. 23, Dr. B.G. Marsden has calculated the following hyperbolic elements, peturbations by all nine planets being taken into account (MPC 5639):

T	1979 Jul. 15.40264 ET		Epoch 1979 Jul 26.0 ET	
Peri.	10°.10681		e	1.0010596
Node	292.43822	1950.0		
Inc.	92.17521		q	4.6869157 AU

1979f=1979 IV. P/Holmes. Recovered by C.-Y. Shao and G. Schwartz on 1979 Jul 20.30 U.T. using the 155cm reflector at the Agassiz station of Harvard College Observatory. Of magnitude 19.5, the comet was almost stellar in appearance, the recovery position being in close agreement with the prediction in the Handbooks 1978/79.

First discovered in 1892, the comet was lost between 1906 and 1964 and was making its 6th recorded appearance.

1979g=1979 VIII. P/Schwassmann-Wachmann (3). A 13th magnitude comet discovered by J. Johnston and M. Buhagiar (Perth Observatory) on 1979 Aug. 13.47 U.T. proved to be P/Schwassmann-Wachmann(3), not seen since the discovery apparition of 1930.

12 observations between 1979 Aug. 13 and Sept 18 were obtained and using these, Dr. B.G. Marsden supplies the following elements which are not linked to 1930 (MPC 5031):

T	1979 Sept. 2.78379 ET			
Peri.	198°.74285		e	0.6936642
Node	69.27445	1950.0	a	3.0713584 AU
Inc.	11.40756		n°	0.18310842
q	0.9408671 AU		P	5.38 yrs.

1979h Kowal. Discovered by C.T. Kowal (Hale Observatories) on 1979 Jul. 24.21 U.T. using the 122 cm Schmidt telescope at Palomar. The comet was diffuse without condensation or tail, magnitude 19. Only three observations were obtained, over the period Jul 24 - 27, and it was not possible to determine a reliable orbit. Although calculations by Dr. B.G. Marsden suggest that the comet might have been at perihelion in 1978, no Roman numeral was designated.

1979i=1979 IX. Meier. Discovered by Rolf Meier (Ottawa) on 1979 Sept. 20.06 U.T., a diffuse object with condensation of magnitude 11.5. On 1979 Sept. 24, a plate taken with the 155 cm reflector by C.-Y. Shao at the Agassiz station of Harvard College Observatory showed a short tail and on Sept. 25, M. Hoffman (Hoher List Observatory) recorded a tail 5' long in p.a. 40° using a 30cm f/5 astrograph.

Visual magnitudes reported during late September and early October were fairly constant between 11.5 and 12 but by Nov. 13, an integrated magnitude of 13.5 was deduced from a plate taken by H.B. Ridley at Woolston Observatory.

By December it was apparent that the orbit differed significantly from a parabola and the following elements by Dr. B.G. Marsden are based on 31 observations 1979 Sept 20 - Dec. 25, perturbations by all nine planets being included (MPC 5175):

T	1979 Oct. 17.35657 ET		Epoch	1979 Oct. 14.0 ET
Peri.	112°.58877		e	0.9736685
Node	296.93081	1950.0		
Inc.	67.08791		q	1.4322965 AU

1979j. P/Reinmuth(1). Recovered by G. Schwartz and C.-Y. Shao on 1979 Oct. 22.15 U.T. using the 155cm reflector at the Harvard College Observatory's Agassiz station, a full year before perihelion. The comet was diffuse and only weakly condensed, magnitude around 20.5. The recovery position was in very close agreement with the prediction in the Handbook 1979.

Originally discovered in 1928, the comet was making its 7th recorded appearance.

1979k. P/Schwassmann-Wachmann(2). Not due at perihelion until March 1981, this comet was recovered by G. Schwartz on exposures taken on 1979 Dec 14 and 15 using the 155cm reflector at the Agassiz station of Harvard College Observatory. The comet was of stellar appearance, magnitude 20.5 and the recovery position was in close agreement with the prediction in the Handbook 1980.

Discovered in 1929, the comet has been observed at every revolution, this being the 9th appearance.

1979I=1979 X. Bradfield. The only bright comet of the year was discovered by the indefatigable Bill Bradfield (Dernancourt Nr. Adelaide) on 1979 Dec. 24.75 U.T. The comet, of magnitude 5, was diffuse with condensation and had a short tail. Comet Bradfield continued to brighten to reach a peak of around magnitude 4 in 1978 January and developed a tail up to 2° long. Twin tails were reported with streamer activity. By the end of January, the comet was beginning to fade and a steady decline took the magnitude down to 8.8 by the end of February and to around 11 by early March.

Observations from 1979 Dec. 26 to 1980 March 10 showed a significant departure from parabolic motion and using 89 observations over this arc and including perturbations by all nine planets, Dr. B.G. Marsden has calculated the following elements (MPC 5411):

T	1979 Dec. 21.60028 ET	Epoch	1980 Jan. 2.0 ET
Peri.	257°.57597	e	0.9876454
Node	102.50989 1950.0		
Inc.	148.60401	q	0.5451825 AU

S.W. Milbourn

Report on Observations of Comets:

P/Stephan-Oterma 1980g

P/Tuttle 1980h and Bradfield 1980t — Graham S. Keitch

The observations of the various recent comets are far too numerous to tabulate completely so, in this report, the writer describes Comets P/Stephan-Oterma, P/Tuttle and Bradfield while a future Bulletin will report on P/Encke, Meier and Panther. Orbital and recovery details are not given as these are usually covered by S.W. Milbourn's annual reviews. In the photometric analyses which follow, brightness behaviour is described according to the usual formula: $M_1 = H + 5 \log \Delta + 2.5n \log r$. Unfortunately, it is evident that many M_1 estimates were made without regard to proper methods and standards! An article on this subject is in preparation for the Journal while the writer will assist observers with comparison star magnitudes, as mentioned in the last Bulletin. Observers should use recognised extra focal methods (the I-O is generally preferred) and comp star mags must be known accurately. The fainter mags in the SAOC are not very reliable and it is preferable to use V.S. sequences wherever possible. It is not advisable to select a single comparison star of $6^M.7$ and then say the comet is $8^M.9$; at least 2 comp stars should be used and for greater accuracy, it is best if they are not more than 1^M apart. Without doubt, binoculars provide superior images for the photometry of brighter comets and observers using the correct methods with suitable instrumentation can often agree to within a few tenths of a mag. The writer opposes the view that M_1 estimates can be expected to show a scatter of several magnitudes. Observers wishing to contribute estimates for analyses and onward transmission to the ICQ, should be aiming for an accuracy approaching a few tenths of a mag and only in difficult circumstances should scatter exceed $0^M.5$ after corrections have been applied for instrumental aperture effects. Only consistant estimates secured by recognised methods were used for the analyses here and aperture corrections were applied according to Morris' formula which adopt adopts a standard aperture size of 6.78cm(1).

TABLE I

Observer	Principal Location	Principal Instruments
Alcock, G.E.D.	Peterborough	Naked eye
Allen, C.	(not recorded)	20x70B
Bembrick, C.S.	Queenscliff, Sydney, NSW	7x50B, 7.5cm OG
Blaxall, K.W.	Colchester	22cm refl.
Bortle, J.E.B.	Stormville, NY, USA	32cm refl. 10x50B, 20x80B

Canton, A.	Bradford	7x50B
Clark, M.	Dowerin, W. Aust.	25cm refl. 12.7cm OG
Cook, T.	W. Australia	10.5cm spec refl.
Entwisle, L.	Elland, W.Yorks	10x50B
Fearon, G.	W. Australia	20cm spec. refl.
Frydman, D.H.	Willesden, London	12.3cm OG
Gainsford, M.J.	Burbage, Leics	25cm spec refl.
Hendrie, M.J.	West Bergholt, Colchester	13x60B, 10cm Cooke F/4.5 (P)
Hurst, G.M.	Wellingborough, Northants	15x80B 26cm refl.
Jones, A.F.	Nelson, N.Z.	4.5cm OG, 7.8cm OG, 32cm refl.
Kaila, K.	Samatti, Finland	10x70B, 20cm refl.
Keitch, G.S.	Wrington, S.Avon	10x50B, 20x80B, 30cm refl.
McKim, R.J.	Colchester	10x50B, 20x80B, 20cm OG
Morris, C.S.	Harvard, Mass. USA	12x50B, 20x80B, 25cm refl.
Panther, R.W.	Walgrave, Northants	15x80B, 12cm OG, 20cm spec 31cm refl.
Pickard, R.D.	Hadlow, Kent	7x50B, 40cm refl.
Ridley, H.B.	W. Chinnock, Somerset	7cm OG, 8cm OG, 78mm F/4.5(P)
Shanklin, J.D.	Cambridge	10x80B, 20cm OG, 32cm OG, 15cm refl.
Sturdy, K.M.	Helmsley, N.Yorks	22cm refl.
Taylor, M.D.	Wakefield, W.Yorks	7.6cm OG 15x70B

Comet P/Stephan-Oterma (1980g)

The recent apparition of this comet was very favourable with the comet at perihelic opposition during early December 1980. JEB first located the comet on 1980 Sept 7.35 UT and 9.35 when it appeared as a small diffuse object of $13^{M}.1$ and 0'.9 dia (56000Km) in his 32cm reflector. By mid month both JEB and CSM (25cm spec) agreed the comet was 12.4-12.5 while JEB noted a nucleus of $13^{M}.5$-$14^{M}.0$. On Sept 19.37 he also noted that the small 1½' coma was elongated to the south. Using AAVSO sequences CSM found the object to be $10^{M}.9$ on Oct 9.34 while GSK made the magnitude a little brighter with BAA sequences. On Oct 18 both RWP and GSK found the coma to be rather small and suddenly condensed towards the middle and on Oct 22.42 JEB found this brighter condensed region to be offset well north of centre. Most observers were aware of the intense condensation by November and a good number could also see a weak outer-coma to about 2'. In fact, binocular observations by CSM and GSK during early November showed the weak halo to be 4'-5' across (145000Km) and both observers agreed the magnitude was 9.2-9.3 on Nov 1 and 3. CSM's 25cm refl showed 2 tails (one for 20' in PA 225°, the other for 15' in PA 180°) and this detail is surprising in view of the comet's faintness. Nearly a week later it was still only $9^{M}.1$ according to JEB who used a 20x80B on Nov 9. Considerable tail development was also noted by GSK on Nov 26.85 with the 30cm reflector. Most of the comet's light was concentrated into the not quite stellar condensation while a diffuse broad tail was observed between PA 257°-282°. A narrow tail was also suspected for 4' in PA 151°. A similar arrangement was again viewed on the following night when the diffuse broad tail was noted for 10' in PA 243° with the 30cm refl. while the 20x80B showed the narrow tail in PA 168° for 20'.

By the end of Nov. GSK also suspected a feature towards the NE and this, together with a $12^{M}.5$ nucleus, gave the comet a most interesting appearance. JS (20cm OG) noted a tail for 3' in PA 200° on Nov 30.86 when the coma was more diffuse to the east and GMH reports that he noted an elongation in PA 170° with his 25cm reflector. Most of the features reported at this time extended between PA 150°-250°. The dense circular inner region was now surrounded by an extensive weak diffuse disc and this prompted CSM to describe the comet as looking like two superimposed objects. Observers attempting photometry with large instruments using the I-O (comet in focus, star out of focus) would have stood little chance of securing reliable estimates. At best it would have been necessary to defocus the comet to smooth out the worst irregularities (as in the O-O or Morris methods). Low power binoculars were able to reduce the levels of image size and detail to more managable proportions allowing the I-O method to be used. Furthermore, a binocular was able to show much more of the coma which, by the end of Nov. was around 6'-7' dia. (1.73×10^{4} Km) (173,000 km). In view of the difficulties presented by the intensely condensed coma it is not surprising that estimates between 6.5 and 10.0 were reported by observers with large instruments over the Christmas period.

However, JEB, GMH, CSM and GSK all agreed that over the whole of December the comet was always somewhere between $8^M.3$-$8^M.8$ in 8cm binoculars. There is some evidence to suggest the comet possibly flared up once or twice in Nov. although, for the rest of the apparition, it was stable. On Nov 13.18, CSM found the comet to be unusually large (14'-18') and bright (7.3) while on Nov 27.88, GSK traced the weak outercoma over 12' (318000 Km).

During early December the comet possessed a reasonably prominent diffuse tail which shows up well on numerous photos taken around this time when the comet was very well placed from early evening onward. The comet made a very close approach to M1 on the night of Dec 5-6 and it was only 12' away when JEB observed on Dec 5.15. Observers agreed that the two objects were similar in size and brightness, although the comet was more circular and condensed. On this particular night CSM, GSK and various JAS CS members recorded the diffuse broad tail in PA 230°-240° while the latter two and JEB also mention a virtually stellar nucleus of $12^M.0$-$12^M.5$. Similar detail was seen by JS on Dec 6, 7 and 8. By mid Dec. JEB's 32cm refl showed the nucleus at $12^M.9$ emitting material towards PA 135° and a 6' tail in PA 225° while GSK found the inner coma to be spikey at x142. In excellent conditions, GSK saw the tail in PA 225° stretching for at least 20' in 20x80B on Dec 16.07 and a shorter extension to the NE was also noted.

As 1981 began, the intense condensation began to fade and the comet was no longer a binocular object after the second week of January when its brightness had dropped to around $9\frac{1}{2}^M$. The detailed appearance of the coma was also less evident as it became more diffuse although the condensation was still reasonably prominent during midmonth as noted by JEB, CSM and GSK. For Jan 31.02, JEB described the coma as being $10^M.3$ and 3!5 (135000 Km) with a tiny 3" condensation emitting material to the east before bending southward. A similar arrangement was noted for Feb 6.01, by which time the coma had become very diffuse with a tiny 13^M nucleus; quite unlike the intensely condensed object observed before perihelion. JEB and CSM were finding a coma size of 2!5 (104000 Km) at $10^M.5$ around this time while by the end of Feb. the comet was 12^M and becoming very difficult but still with a trace of condensation GSK found the coma to be 1!0 dia and $12^M.3$ on Feb 28.93 while JEB observed the comet at similar brightness during the next few days into March when it was lost as an extremely vague, totally diffuse object near the limit of the 32cm reflector.

For the photometric analysis, estimates by JEB (27), MC (12), GMH (5), GSK (45) and CSM (41) were used together with 15 selected estimates by JS and 1 by RWP. The 80 preperihelion estimates give n = 9.75 and H = 4.70 while 66 post perihelion estimates give n = 7.90 and H = 5.55. The noticeable pre/post perihelion assymetry is hardly surprising in view of the comet's change in appearance after perihelion on Dec 7. Both before and after perihelion the high n - value is especially intriguing and it yields a value for the H parameter which is several magnitudes brighter than is usual for most short period comets. The high n value is especially intriguing as spectrographic studies show this comet to be relatively dust rich(2). Indeed, the section's visual observations of the broad diffuse tail also suggest a dusty nature. It should be noted, however, that the heliocentric variation of 1.6-1.9 AU for both the pre and post perihelion arcs is rather small.

TABLE II : SELECTED UNCORRECTED ESTIMATES FOR 1980g

Date	M_1	Inst	Observer	Date	M_1	Instr	Observer
1980 Sept 7.35	13.1	32L	JEB	1980 Dec 18.16	8.6	8B	JS
16.38	12.5	25L	CSM	26.06	8.7	8B	CSM
Oct. 8.34	11.2	32L	JEB	31.88	8.8	8B	GSK
20.37	10.5	32L	JEB	1981 Jan 6.11	9.2	25L	CSM
29.06	9.9	30L	GSK	11.14	9.5	8B	JEB
Nov. 3.00	9.3	8B	GSK	25.81	9.7	30L	GSK
9.15	9.1	8B	JEB	30.18	10.3	25L	CSM
17.40	8.6	8B	CSM	Feb 6.01	10.5	32L	JEB
30.09	8.6	8B	GSK	28.93	12.3	30L	GSK
Dec. 4.11	8.4	8B	JEB	Mar 2.05	12.2	32L	JEB
15.20	8.4	8B	CSM				

(Instrument code: L = reflector, B = binocular. Aperture in cm)

Comet P/Tuttle (1980h)

Predictions by D.W.E. Green suggested this comet would first become visible in amateur instruments during 1980 Oct-Sept[3]. A plate exposed by JEB with the 20cm Schmidt reached a stellar limit of 15^M on Sept 8.37 but did not record the comet. The first sightings reported in the ICQ are those of J. Morgan (WI, USA) who found the comet at $11^M.0$ in a 32cm refl. x56 on Sept 27.11 while the same observer noted a value of $10^M.6$ on Oct 3.10[4]. GSK (30cm refl. x62) located the comet on Oct 8.14 when the 3!3 (184000 Km) coma was $10^M.6$. Very soon JEB and CSM had the comet under observation with slightly higher powers which made the large diffuse object appear somewhat smaller and fainter. This has to be considered when determining the (h, n) parameters as discussed later. The general size and appearance of the comet was established by MJH who took a 30 minute exposure with the 10cm F/4.5 Cooke on Oct 9.97 which confirmed the coma to be a good 3!5 dia. Around this time, both visual and photographic observers were aware of a slight condensation. By Oct 12.08 GSK was observing with 20x80B and by Oct 18.04 the same nstrument showed a large coma of 8!4 dia (377000 Km) although it was generally noted as being nearer 5' (224000 Km) at this time. A smaller 10x50B gave $8^M.8$ on Oct 21.17 although it was early Nov before the comet was more widely observed in b noculars. During November JEB, CSM and GSK produced a long run of binocular observations with scatter rarely exceeding $0^M.2$. Selected aperture corrected values obtained with 5-8cm binoculars are given in Table 3.

TABLE III : SELECTED BINOCULAR ESTIMATES FOR 1980h

Date 1980	M_1	Observer	Date	M_1	Observer
Oct. 21.17	8.9	GSK	Nov. 17.39	7.6	JEB
31.20	8.5	GSK	19.41	7.1	CSM
Nov. 2.38	8.3	JEB	Dec 1.16	7.0	GSK
3.24	8.2	CSM	4.35	6.9	CSM
6.38	8.1	CSM	7.20	6.9	GSK
10.11	7.9	GSK	11.44	6.8	JEB
13.41	7.8	JEB			

During early Nov the comet became more condensed and JEB (32cm refl.) found the coma to be slightly elliptical in PA 100°-280° with a possible $13\frac{1}{2}^M$ nucleus. According to JEB the condensation was offset noticeably northwest of centre on Nov 9.41 while a few days later GSK once or twice suspected a tail to the northeast in binoculars. This feature could not be detected on Nov 10.11 in good skies at woolston Observatory although the coma possessed a rather spikey appearance which shows up on a plate exposed with the 15cm Cooke at Woolston near this date. While JEB, CSM and GSK all agreed the coma was around 10' dia (261000 Km) and $7\frac{1}{2}^M$ in binoculars dur ng midmonth, users of monocular instruments were finding the coma to be much smaller and fainter. RWP, HBR and JS all reported values nearer $8\frac{1}{2}$-9^M and 5' for the now moderately condensed coma. By the end of the month, moonlight was beginning to interfere but fortunately the comet had brightened to 6.8-$6^M.9$ according to JEB, CSM and GSK (although some binocular users reckoned the comet to be nearer $9^M.0$!). On Dec 3.16, GSK's 30cm reflector showed a v rtually stellar nucleus of 11-12^M while the coma was fanned towards PA 315°. JEB found a possible narrow tail in PA 290° and 340° with his 32cm reflector. As the comet dived rapidly into the southern skies it must have been near almost naked eye visibility. JEB found a maximum brightness of $6^M.7$ in 10x50B on Dec 11.44 when it was very bright and impressive despite its low altitude. Perihelion occurred on Dec 14.71 by which time, the southern observers MC, AFJ and CS Bembrick Sydney, NSW) were taking over. AFJ considered the $7\frac{1}{2}^M$ coma to be moderately condensed and $3\frac{1}{2}$' dia. (113000 Km) by the end of Dec when he used a 4.5cm finder.

By 1981 mid Jan. the fairly well condensed coma had faded to $8\frac{1}{2}^M$ and on Feb 15.67 it was $10^M.0$ in AFJ's 7.8cm finder. Remarkably the same observer reports observing the comet in the 7.8cm finder at $11^M.3$ (!) on Mar 13.69 when r = 1.65 AU although the 32cm refl. showed the coma to be $1\frac{1}{2}$' across (28000 Km) and $11^M.7$. At the same heliocentric distance before perihelion the comet was totally invisible in large visual instruments. The general appearance of the comet w th little tail development is apparently typical of this object according to those who have investigated earlier apparitions[5][6].

Despite the favourable apparition (during which the comet's elongation was never less than 70°) the comet was a morning object and low in the south when at its brightest. Consequently it was not well observed from the U.K. A good number of estimates were secured by JEB, CSM and GSK and these preperihelion magnitudes together with the post perhelion results by AFJ were used for the photometric analysis. The heliocentric variations and distribution of observations is given in Table IV.

TABLE IV

Preperihelion			postperihelion		
r(AU)	Observer	No. of obs.	r(AU)	Observer	No of obs
	JEB	17			
1.424-	AFJ	5	1.015-	AFJ	24
1.015	GSK	24	1.645		
	CSM	17			

The previously mentioned disagreement over the initial estimates at the time of visual recovery reflects noticeably in the (H, n) values. An analysis by Green and Morris[7] using results principally by JEB and CSM, but also including some other ICQ data, produces preperihelion values of H = 7.97 and n = 6.01. This n value is certainly high especially as a postperihelion value of only 3.88 is found. The comparatively low post perihelion value is attributed to a short r variation and small number of obs but in actual fact, the writer finds a very similar value for AFJ's estimates which over quite a reasonable arc AFJ's post perihelion estimates give H = 8.36 and n = 3.15 while all the BAA preperihelion data due to JEB, AFJ, CSM and GSK give H = 8.39 and n = 3.43. The overall pre and post perihelion values are therefore in excellent agreement according to this analysis. The formula $M_1 = 8.4 + 5 \log \Delta + 8.6 \log r$ should give reasonable predictions for future apparitions. However, the comet being large and diffuse is unlikely to be recovered visually by amateurs until it is around 11^M; a condensed object by comparison can be picked up nearer 13^M e.g. P/Stephan-Oterma. It is also possible that the comet brightens rapidly at some stage during the inward journey when its distance from the Sun is near 1.5 AU.

Comet Bradfield (1980t)

This was W.A. Bradfield's eleventh discovery which was made on 1980 Dec 17.75 when the 5th mag comet had a $\frac{1}{2}°$ tail. According to MC the coma was $5^M.3$ and 1!5 dia with a 25' tail in PA 180° as seen in the 25cm reflector x 50 on Dec 21.84. It was realized that circumstances for observation would be very poor with the comet never lifting clear of twilight over the western horizon, although it was expected to be very bright to begin with. It was also predicted to fade rapidly and generally little was hoped for. JS secured the comet on Jan 4.72 when he saw and photographed a strongly condensed coma with a straight tail in PA 20°. George Alcock (Peterborough) also observed on the same night when the comet was around 3^M with a yellowish dust tail at least 3° long. The comet was $3^M.9$ according to JEB who noted a 3°.5 tail in PA 35° with 10x50B on Jan 5.95. GSK observed on Jan 9.77 when the comet was a spectacular sight in vinoculars with a superb 4° dust tail pointing upwards from the very intense almost stellar coma which was $4^M.9$ in 10x50B. The coma was 2!4 across (99000 Km) in 20x80B. The comet was widely observed on Jan 10 when most observers agreed the brightness was around 5.2 in binoculars and by now it was evident that it was not fading anything like as rapidly as expected. However, moonlight was now beginning to add to the twilight.

A fine photograph on Jan 10.76 by HBR has been published in the Journal[8]. The 10 minute exposure with a Dallmeyer Serrac f/4.5 350mm fl lens shows a bright tail at least 5° long in PA 28° with a spine and one or two oblique rays streaming away from the 2'-3' very condensed coma. Until the night of Jan 12 estimates by most observers agreed closely because the coma was almost stellar in binoculars and reliable mags where available for the brighter comparison stars. On Jan 12, a wider range of estimates between $5\text{-}6^M$ was reported. Possibly, the comet was becoming unstable as a 1^M flare occurred on the night of Jan 13. The comet was $4^M.4$ on Jan 13.96 according to CSM and the flare was independantly noted by members of the Dutch Comet Workgroup. Unfortunately, skies over the U.K. were cloudy on the night in question but

GSK was surprised to find the comet at $5^M.2$ several days later on Jan 15.75 and 16.75 when the comet was expected to have faded considerably. On these dates, RWP, HBR, JS, MDT and GSK all agreed the magnitude was 5.0-5.4. Another photograph was secured by HBR on the latter date. The exposure shows a 5° tail in PA 34° despite bright/moonlight and low altitude although, in binoculars, the tail was only 1½°. IAUC 3569 reports that Stephen O'Meara (20cm OG Cambridge, USA) observed a secondary nucleus on Jan 19.96, 20.95 and 21.95. The observations were independantly confirmed by JEB on Jan 21.98 when the secondary component in PA 40° was 2'.5 from the primary nucleus with other possible condensations to the NW and SE. The nucleus had apparently split up and the flare of Jan 13 was almost certainly part of the same event. The comet's low altitude prevented most observers from viewing with large instruments although Keith Blaxall (Colchester) used a 21cm reflector x 40 on Jan 24.75 UT and found the coma had grown to 4'.0 (261000 Km) with a slightly irregular nuclear region. The same night, MDT's 7.6cm OG also showed a non circular condensation. HBR continued photographic coverage and a 6 minute exposure on Jan 25.77 showed a 3' coma, moderately condensed with a tail in PA 37°. GSK made the comet $7^M.0$ on this date with a 1° tail in 20x80B.

By the end of February the comet had faded to $7^M.6$ according to JEB and CSM and for observers in the U.K. it was now extremely low in twilight. On Feb 1.76, JS observed the straight narrow tail for 1° while the well condensed 3' coma showed signs of faint hoods in the 15cm reflector x 67. The comet was still $8^M.0$ in 20x80B when GSK lost it in twilight on Feb 4.78. Revised predictions based on a slower rate of fade suggested the comet may be visible as a faint 12^M object in the morning sky during March but the writer is not aware of a successful recovery.

Fifty four aperture corrected post perihelion estimates were analysed covering the period 1981 Jan 5.95 - Feb 4.78 (r - 0.35 - 1.03) and these were selected as follows.

JEB (12), A. Canton (1), L. Entwisle (1), MJH (1), GMH (2), GSK (10), CSM (15), RWP (1), HBR (4), JS (5) and MDT (2).

Estimates referring to the Jan 13 outburst were not used as the flare was not typical of the apparition in general. The H value is 7.00 while the n value of 2.12 indicates that the comet behaved essentially as if it were a purely reflecting body. There is no doubt the comet was very dusty in view of the impressive bright type II tail which was visible throughout the period of observation and which made this comet the most impressive since Great Comet West in 1975. A few uncorrected estimates are given in Table V.

TABLE V : SELECTED UNCORRECTED ESTIMATES FOR 1980t

Date 1981	M_1	Inst	Observer	Date	M_1	Inst	Observer
Jan 5.95	3.9	5B	JEB	Jan 14.77	5.3	7B	MDT
8.95	4.5	5B	CSM	15.75	5.2	5B	GSK
9.77	4.9	5B	GSK	16.77	5.2	8B	JS
10.75	5.1	6B	MJH	19.96	6.2	8B	CSM
10.96	5.2	5B	JEB	21.97	6.8	5B	JEB
11.95	5.5	8B	CSM	25.77	7.2	8R	HBR
12.77	5.8	8B	RWP	28.97	7.6	8B	CSM
12.96	5.4	5B	CSM	30.98	7.6	8B	JEB
13.96	4.4	8B	CSM	Feb 1.77	8.1	8B	GSK

(B - binoculars; R - refractor: Aperture is cm)

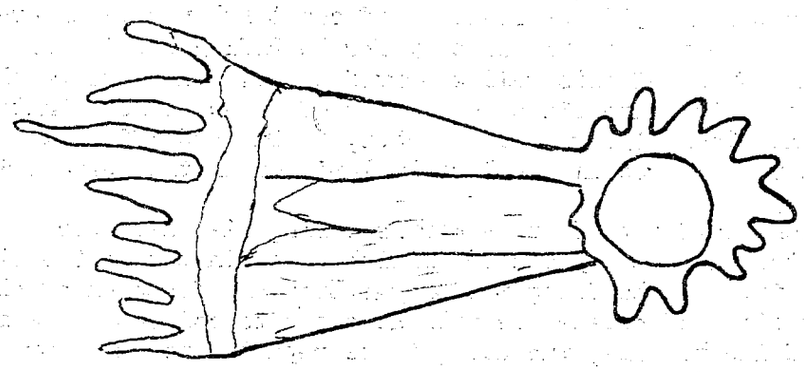
(My thanks to S.W. Milbourn who computed the (Δ, r) values and Mr. P. Stanley who assisted in processing some of the data. GSK)

References:

(1) Morris, C.S., Publ. astrom. Soc. Pacific, 85, p506 (1973)
(2) Green, D.W. and Morris, C.S., ICQ, 3, p42 (1981)
(3) Green, D.W., ICQ, 2, p62 (1980)
(4) ICQ, 2, p84 (1980)
(5) Morris, C.S. and Green, D.W., ICQ, 3, p44 (1981)
(6) Ridley, H.B., Instrimirant Stella, 14, p6 (1980)
(7) Morris, C.S. and Green, D.W., op cit.
(8) J. Br. astron. Assoc., 91, P214 (1981)

THE BRITISH ASTRONOMICAL ASSOCIATION

COMET SECTION



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FROM THE DIRECTOR

The date of the Section Meeting has had to be changed to avoid a clash with the Winchester Weekend event. The Section Meeting will now be held on 1982 April 3. Details appear in this Bulletin. I hope that it will be well attended. It is many years since the Comet Section last held a meeting of this kind, but I hope that it can become a regular event.

It has been a much less busy year for observers than 1980, but following comet Panther, observed on into the spring, comet P/Swift-Gehrels 1981j became visible in small telescopes and binoculars, even though its predicted magnitude shown in the Handbook was only 15 at maximum. A full report of the behaviour of this comet will appear in the next Bulletin (on 1982 January 27.9 G. Keitch made it still 10.8 mag but 2 days later it was down to 12.1 mag.)

While not becoming an easy object, comet P/Kearns-Kwee 1981h reached about 13.5 magnitude in 1981 December and was observed visually by Graham Keitch and photographed by Alan Young and the Director from reports so far received. This comet was at least 2 magnitudes brighter than the value given in the Handbook. For periodic comets these predicted magnitudes usually more nearly equate to "nuclear" magnitudes, those obtained photographically for astrometric purposes, and often they do not include the outer coma seen in small telescopes. Clearly we need to be on our guard against assuming that these periodic comets will be too faint for us to observe. Research into performance at previous apparitions can be useful, though not an infallible guide, and Harold Ridley has looked at those periodic comets for 1982 to see which are likely to be within the reach of observers.

EXHIBITION MEETING - Saturday 1982 May 29

The Association's annual Exhibition Meeting will again be held on the last Saturday in May at the Hawkstone Hall, Kennington Road, London SE1. Details will appear in the April Journal. Members of the Section having exhibits of drawings, photographs, etc. or equipment are asked to advise the Director by April 17 so that he may book space with the Meetings Secretary.

INTERNATIONAL COMET QUARTERLY

We have now sent to the ICQ 533 observations of comet Kobayashi-Berger-Milon 1975 IX. These have been prepared by Harold Ridley who is now examining the light curve of this well observed comet. Also despatched to the ICQ by Graham Keitch are 614 observations of recent comets Encke, 1980b, 1980g, 1980h, 1980i, 1980k, 1980q, 1980t, 1980u, and 1925 II. Reports of these have appeared in the last Bulletin or in the current issue.

Following discussions held with Charles Morris during his visit here last summer, Graham Keitch has been appointed British Co-ordinator on the staff of the ICQ. In addition to handling the preparation and despatch of all current BAA observations of comets, he will also act to collect those made by other groups and individuals, including those reported to The Astronomer. This should help to standardise methods, reduction and publication, and rescue some observations that might not otherwise reach the ICQ.

TERRESTIAL PLANETS SECTION - Minor Planets Group

Since the formation of the Minor Planets Group last summer we have been in touch with Richard Baum, the Section Director, and Andy Hollis, the Co-ordinator to see how we can co-operate on areas of work of mutual interest. The provision of photometric sequences is one such area.

There is a Minor Planets supplement to the Section's publications and a six-monthly "Minor Planets" bulletin, available to those interested.

ROMAN NUMERAL DESIGNATIONS OF COMETS

1979 XI	1979 Aug 30.9	Howard-Koomen-Michels	
1980 I	1980 Apl 11.1	P/Honda-Mrkos-Pajdusakova	1980c
1980 II	1980 Apl 19.9	Torres	1980e
1980 III	1980 May 19.5	P/Russell 2	1980o
1980 IV	1980 Jun 22.4	Cernis-Petrauskas	1980k
1980 V	1980 Sept 3.4	P/Lovas	1980s
1980 VI	1980 Sept 24.7	P/Forbes	1980a
1980 VII	1980 Oct 5.1	P/Wild 3	1980d
1980 VIII	1980 Oct 29.8	P/Reinmuth 1	1979j
1980 IX	1980 Nov 25.4	P/Brooks 2	1980f
1980 X	1980 Dec 5.2	P/Stephan-Oterma	1980g
1980 XI	1980 Dec 6.6	P/Encke	
1980 XII	1980 Dec 9.7	Meier	1980q
1980 XIII	1980 Dec 14.7	P/Tuttle	1980h
1980 XIV	1980 Dec 24.6	P/Harrington	1980m
1980 XV	1980 Dec 29.5	Bradfield	1980t

DESIGNATIONS OF COMETS DISCOVERED & RECOVERED IN 1981/1982

1981a	P/Longmore
1981b	P/Bus
1981c	Elias
1981d	Bus
1981e	P/Finlay
1981f	P/Gehrels 2
1981g	Gonzalez
1981h	P/Kearns-Kwee
1981i	P/Slaughter-Burnham
1981j	P/Swift-Gehrels
1981k	P/Howell
1981l	P/ Vaisala 1
1982a	P/Grigg-Skjellerup

Probable Comet (Eberst)

IAUC 3657 reports that R.D. Eberst, Royal Observatory, Edinburgh has found a trail of a comet on a 60 minute exposure of the ESO/SRC Southern Sky Survey. The date of the exposure was 1975 May 11.5 and the comet was of 15 magnitude. No confirmation has been reported yet.

Possible Comet Stättmayer

IAU Circular 3638 carried the report of a possible 13 mag comet near M33 on two 20 minute exposures with a 30cm f/6 reflector by Peter Stättmayer near Munich on 1981 Sept 6.0. The plates were measured by R.M. West (ESO) but a visual search on the next morning by Edgar Everhart failed to show a comet.

IAUC 3642 reported that exposures with the Palomar 1.2m Schmidt and the 30cm astrograph at the Lowell Observatory failed to show any comet, nor has there been any confirmation from any source.

Possible Comet Shcherbanovskij

IAUC 3655 reported the possible discovery of a 16 magnitude comet by A.L. Shcherbanovskij communicated by the Institute of Theoretical Astronomy, Leningrad. The discovery, on 1981 Dec 19.9 has not been confirmed. IAUC 3656 reported that searches by Everhart at the Chamberlin Observatory, and at Oak Ridge on Dec 30.3 and 31.3 failed to reveal anything brighter than 19 mag within 0.5 degree of the extrapolated position.

Comet Howard-Koomen-Michels 1979 XI

IAUC 3640 reported the discovery of images of a comet on coronagraph exposures from the P78-1 satellite in 1979. The observations were made on 1979 August 30.789 to 30.885 after which the head, which was somewhat brighter than Venus, disappeared behind the occulting disc and did not re-appear on the far side of the Sun. From 8 accurate positions obtained over this very short arc, and from a study of the appearance of the tail as it swung round the Sun, remaining visible after the head was hidden, Z. Sekanina, JPL reports in IAUC 3647 that there seems little doubt that the comet was a member of the Kreutz sungrazing group of comets.

A few comets passing close to the Sun have appeared after perihelion to have been without a head, the tail matter having left the comet before perihelion. It would seem that this comet did not survive the close approach or collision with the Sun and only the tail survived for a while but observations after perihelion were also limited by the coronagraphs 5 degree field.

The two circulars mentioned were devoted to these observations and the Comet News Service review issue 81-4 devotes three pages to reporting this comet. Delay in releasing information on these observations was no doubt due to the coronagraph being aboard a U.S. Defense Dept. satellite.

SECTION MEETING - 1982 April 3

Please note that the Section Meeting announced in the last Bulletin will now be held on Saturday April 3 and not April 17.

We have booked the Hawkstone Hall, Kennington Road, London, SE1 from 10.30 until 17.00 hours. This hall is that used for the annual exhibition meeting and the JBAA for 1981 April has a sketch map of its location, near Lambeth North (Bakerloo) station. The Elephant & Castle (underground) and Waterloo stations are also within walking distance.

Dr. David Hughes will speak on Halley's comet space observations and on cometary decay, George Alcock on discovering comets, Harold Ridley on cometary photography and Graham Keitch on Visual photometry of comets. Time permitting we hope to have contributions on recording inner-head features, prospects for Halley's comet, and possibly on requirements for cometary astrometry.

Readers requiring the latest information about the meeting are invited to send a stamped addressed envelope to the Director for return early in March when firm arrangements will, we hope, be known. (A4 or foolscap size please). It is intended that the formal talks should be arranged so as to leave time for participants to meet and discuss their problems and points arising from the presentations. We hope that as many readers as possible will attend whether they are regular members or not. As with all Section meetings in the BAA, they are open to all members and their guests and are not restricted to active members of the Section.

Prospects for 1982 - H.B. Ridley (1982 January 25)

A quick look through the ephemerides of periodic comets in the 1982 Handbook of the B.A.A. gives the impression that the outlook for observing these objects is pretty dim, until one notices that the magnitudes given are of the m_2 variety. These so-called 'nuclear' magnitudes are derived from short exposures made with big reflectors for astrometric purposes when the comets are at large heliocentric distances. They should really be called "photographic recovery magnitudes" for once the comet gets closer to the Sun and develops an appreciable coma they cease to correspond to any measurable reality - a pure nuclear magnitude is indeterminable at that stage. It is time that the Handbook gave the observers for whom it is intended a more realistic guide to the expected brightness of returning comets.

We are fortunate this year in that three periodic comets will be at opposition close to their respective perihelia and will therefore approach their greatest possible apparent brightness, bringing them within reach of modest instruments. In addition, the long-enduring Comet Bowell will come to its distant perihelion, its intrinsic brightness compensating for its remote position.

Our legacy from 1981, in the form of comets P/Kearns-Kwee and P/Swift-Gehrels will have faded from view by the time these notes appear, but both, particularly the latter, are examples of the misleading nature of m_2 magnitudes for our purposes. P/Swift-Gehrels was at least five magnitudes brighter than the values given in the Handbook, and many observers were caught off guard by this unexpected bonus. The following notes may help observers to avoid a similar situation this year.

Comet Bowell, 1980b, will be at perihelion in March, and during the first half of the year it moves from Libra, passing a few degrees north of Antares in January, through the southern part of Ophiuchus and on in to Sagittarius. It will be at rather low altitude for U.K. observers but at around magnitude 10 it should be readily observable. Observations will be valuable as we need to know more about the behaviour of comets at large heliocentric distances, and it is rarely that amateurs have the chance to contribute to this work. (G. Keitch reports it as $10\frac{1}{2}$ mag in late January.)

P/Grigg-Skjellerup. This comet is intrinsically faint, but its orbit can bring it very close to the Earth, as it did in 1977. This year's approach is a little less favourable but still close enough to raise the expected brightness to 9th magnitude in May-June. At the beginning of the year the comet will be down near Sirius and very faint, moving northwards to cross the equator near Procyon towards the end of April. It then moves quickly through Cancer into Leo Minor and Canes Venatici in the latter part of May and early June, when it will be at its brightest. It then passes southwards through Bootes and Hercules, fading rapidly.

An interesting point about this comet is its potentiality for generating meteor showers; in 1977 a good display was seen in Australia, and the radiant is listed in the Meteor Diary of the Handbook as the pi-Puppids. Northern observers, of course, cannot expect to see much, as the declination of the radiant is -44°. This year the Earth is at the node three weeks before the comet, but this does preclude the possibility of a shower, as is known from our experience with the Giacobinids.

(IAUC 3659 - recovered by J. Gibson on 1982 Jan 15.3 with the 1.2m Palomar Schmidt magnitude about 19. Position in close agreement with 1982 HBAA.)

P/D'Arrest. This is one of the most interesting of the periodic comets because of the anomalous nature of its brightness changes. Characteristically, it undergoes a strong surge about twenty days after perihelion, the effect of which is to maintain its brightness long after it should have faded. At the best-ever apparition of 1976, the comet came up to 5th magnitude; this year, we may hope for a maximum around 8. Unfortunately for those of us in higher northern latitudes the comet will be at low altitude. From the end of May it moves southwards and by the time that we are likely to see it, it will be near or below the equator in Ophiuchus; at its best, after the post-perihelion surge, it will be down in Sagittarius among the stars of the "Tea-pot". However, every effort should be made to keep this unruly object under close observation.

P/Churyumov-Gerasimenko. It is unusual for a new short-period comet to come up to a reasonable magnitude, for the simple reason that nearly all those that do so have been discovered long ago, but perturbations are constantly reshuffling the pack, and a favourable encounter can bring a previously inaccessible object within range of the smaller instruments. In the present case we do not really know what to expect because the comet has not been observed visually yet, but as it will be only 0.4 A.U. from the Earth when at perihelion there is obviously a good chance that it will be readily visible, probably not fainter than 10th magnitude - maybe brighter. The comet crosses the equator in Cetus near the end of July, moving northwards through Taurus south of Aldebaran and, when nearest and brightest during November it will be well placed in Gemini. At the end of the year it crosses the corner of Auriga and moves into Lynx. It will be interesting to see how this newcomer to our lists shapes up.

P/Schwassmann-Wachmann (1). Although normally around 18th magnitude, this distant comet quite often has outbursts bringing it up to 12th magnitude or even brighter. It will spend the first half of this year lurking a few degrees below the equator on the borders of Leo and Virgo, and its position should be monitored regularly for the chance of an unexpected sighting. There will be plenty to look at in that region, as Mars, Jupiter and Saturn are all in the same part of the sky.

Even without the discovery of new long-period comets (and surely it is time for another good one) we can look forward to a busy and interesting year. We must hope that the normally hostile weather in the U.K. will not inhibit our activities too much.

(IAUC 3660 reports another outburst to 12m on 1982 Jan 16.)

P/Swift-Tuttle 1862 III

This comet hasa period of around 120 years though despite some 200 observations at its last return, the period is uncertain. This comet is associated with the Perseid meteors and so can make a very close approach to the Earth (0.34 AU in 1862), but this depends of course on when it comes to perihelion. The comet can be quite conspicuous, being of second magnitude with a tail reaching 35 degrees, and showing an anti-tail during the 1862 apparition. The comet could be recovered at any time now.

COMETS : REFERENCES TO THE LITERATURE OF 1981 — G.J. Hodgkinson

This is really a concise summary of the literature of 1981 related to comets that the author has seen or heard of, and it is hoped that subsequent reports will in due course present a useful, hopefully complete, bibliography on comets and cometary phenomena. To begin with there are a number of general interest reviews and articles:

New Results in Comet Research, by R. Luest, Naturewissenschaften vol. 68(5), p229-235, 1981.

Comets-Readings from Scientific American, by J.C. Brandt, Publ. by W.H. Freeman, 1981: 92pp.
Hardback: ISBN 0-7167-1319-5, £7.50;
Paperback: ISBN 0-7167-1320-9, £3.50.

Research on Comets from Space, by J. Blamont, Advances in Space Research, vol. 1(9), 1937, 1981.

and there are two articles in Sky & Tel., on observing and searching for comets (vol. 61(3), p210-214, 61(2), p123-5, 1981). While on the subject of comet observations, and for those who do not subscribe to Sky & Telescope, John Bortle's monthly notes ('Comet Digest') may be located by the references:

61(no. 1 Jan.) p31-2; (no.2) p110; (no. 3) p205, 271-2; (No. 4) p294-5; (no. 5) p396; (no. 6) p499;

62(no. 1, July) p29; (2) 125-6; (3) 222; (4) 307; (5) 411; (6) 540.

There are, in addition, notes on Comets Bradfield 19791, Panther (S & T 61(2) 107), Schwassmann-Wachmann I (61(5) 390) and comet Halley and its forthcoming return (61(6), 500-1; 62(1) 22 & 111-3, 123; and also in Nature (London) 290, p290, 1981 and Observatory, 101 (1042), 84-6, June 1981.

Of the technical papers, some comets discussed are:

Kobayashi-Berger-Milon, 1975 IX
M.C. Festou. Astron. Astrophys., 96(1-2), 52-7 (1981).

Kohler 1977 XIV, Meier 1978 XXI.
Crovoisier, J., et al., ibid., 97(1), 195-8 (1981).

Bradfield 19791
Hollis, J., Astrophys. J., 244, 355 (1981)

Kohoutek 1973 XII
Scherb, F., ibid., 243, 644 (1981).

Temple - 2
Johnson, P.E., et al., Nature (London 289, 155 (1981)

and also 'A Monte Carlo Investigation of Jovian perturbations on Short-Period Comet Orbits' in Icarus (vol. 46, no. 3, p400, 1981) by C. Froeschle and H. Rickman.

One of the more unusual reports is of the images acquired by a coronagraph aboard a US defence satellite on 30 August 1979. Over a period of 2½ hours several images were obtained of a cometary object approaching the sun on a collision course. The actual collision was not seen but the resulting debris cloud was. For further details see Nature (London) 293,693 and Sky & Telescope 62 (6), 540 (1981).

'How a cometary nucleus turns on' is the title of an article in Sky & Tel., 62(2), 103-4, 1981 by I.R. Ferrin and E. Guzman. Whereas the title implies a general reference to cometary phenomena, the material is devoted almost entirely to P/Encke and is somewhat contentious. If reference is made to this it would be wise to consult the criticisms of D.W. Green et al., ibid., 62(5), 522, Dec. 1981.

For technical papers related to tail activity as a result of interactions with the interplanetary magnetic field see M.B. Niedner, Jr., et al., Astrophys. J. 245, 1159 (1981) and ibid., 241,820 (1980), and of solar-wind interaction with carbon dioxide and monoxide dominated comets (and comparison with previous results for water-dominated comets) see H.L.F. Houpis, D.A. Mendis in Moon Planets vol. 25(1), 95-104 (1981).

The results of searches for main lines of the hydroxyl radical, OH, at 1667 and 1665MHz were reported for five comets Kobayashi-Berger-Milon 1975 IX, West 1976 VI, Encke 1977 XI, Kohler 1977 XIV, and Bradfield 1978 VII (D. Despois et al., Astron. Ap., 99 (2), 320, 1981).

M.A. Hearn et al., (Astrophys. J. 248, L147, 1981) report on four-colour photometry of comets P/Tuttle, Meier 1980q, P/Stephen-Oterma, and Bowell 1980b. Their J-H and H-K colours are nearly identical. (The effective wavelengths of the J-band is 1.3 m, H at 1.63 m, K at 2.2 m, and L at 3.6 m). The reflection spectra is not consistent with that of an icy-particle cloud but resembles that of C- and S-type asteroids.

COMET OBSERVATIONS

Graham S. Keitch

The last Bulletin reported on the Section's observations of comets which appeared towards the end of 1980 and early 1981. This present report covers the remaining comets visible at that time and since then. In future Bulletins we hope to analyse and report on all comets observed by the Section, and hope this will encourage good quality regular observations. We thank those members listed in the previous Bulletin (pp.7-8) and also those listed below for their recent contributions.

Table 1	Observer	Principal location	Principal instrument
	Dew	Wokingham	13cm Schmidt-Cass
	C. Gilbert	Christan Bank	23cm f/4 (P)
	I. Hancock	Whitstable	22cm refl.

With the exception of P/Encke, the photometric observations have been fitted to the usual formula M = H + 5 log delta + 2.5 log r. Aperture corrections to 6.78cm have been made according to Morris' formulae [1]. The assistance of

D. Brewer, P. Clarke, P. Finch and T. Runney is acknowledged in connection with the processing of the Comet Panther observations as part of the 1981 Space Science Course run by the Somerset Education Authority.

Comet P/Encke

The 1980 apparition of this comet was extremely favourable. A full sequence of observations was secured by JEB, CSM, JS and GSK although, surprisingly, these were virtually the only observations made by the Section. During early December, the comet was impressive at mag. 6 in the predawn sky.

It was first located by JEB with the 32cm reflector on 1980 Sept. 19.35 when the 12m.7 coma was 3'.1 across (113318 km). On Oct. 2.98 GSK's 30cm refl. showed the 10th mag. coma as being ill-defined, diffuse and of low surface brightness while a 40 min. photo by MJH with the 10cm Cooke f/4.5 lens on Oct. 7.97 confirmed the overall appearance noted visually at this time. The table II shows how rapidly the comet's brightness increased during October. The brightness increase was accompanied by an increase in coma diameter and intensity of condensation. On Oct. 14.35, the 8m.4 coma was 10' across (174068 km) according to CSM with a 20x80B while JEB and GSK both agreed the brightness had climbed to 7m.7 by Oct. 18-20. The bright coma was then a large 12'-13' diameter although observers with less suitable instrumentation could see little more than a small glow of mag. 10-11. Binoculars certainly provide superior views and more realistic images for photometry.

An interesting feature of this comet relates to the development of material on the sunward (or more exactly, the afternoon side) of the coma. The effect is the result of solar heating activating 'hot spots' on the inhomogenous nuclear surface and has helped Whipple and Sekanina[2] to determine various parameters such as the period, orientation etc. of the nucleus. The sunward fans and extensions were observed again during this apparition. Extensions to the east and northeast of the coma were recorded by JEB and GSK during the second half of October. Both JEB and CSM saw a sunward tail in p.a. 80° and a narrow normal tail in p.a. 300° on Nov. 2 while the following night, JEB recorded a tail of $\frac{1}{2}^{\circ}$ length in p.a. 260°. On Nov. 9.42 CSM saw a 25' tail in p.a. 340° while GSK noted diffuse material extending from north to east of the coma on Nov. 12.23. Both observers used 20x80B.

Following the rapid rise in the brightness during October, the comet's brightness levelled off around 6m.7 during November. Typical brightness estimates can be seen in table II. After midmonth, the comet underwent a dramatic change in appearance. The coma became very intense and, according to JEB and GSK, appeared to shrink from 11' diameter (143606 km) to a mere 2' (59183 km) on Nov. 25-26. The effect was probably enhanced by the comet plunging into the morning twilight.

The photometric estimates secured principally by JEB and CSM have already been investigated by Morris and Green[3] and the following formula is proposed:

$$M_1 = 9.79 + 2.54(r^{1.8} - 1)$$

A further analysis of BAA results has not been attempted as it is unlikely that the findings of Morris and Green would be improved upon. The rather unusual formula above, based on a format recommended by Sekanina[4], reflects the somewhat unusual behaviour of this comet. The n-parameter constantly changes as the comet's nucleus progresses from a radiative to evaporative state during its inward journey. The absolute mag. of 9.79 does not indicate any rapid diminution in the comet's brightness compared to previous apparitions.

Table II Uncorrected magnitude estimates. P/Encke

Date 1980	m_v	Aperture (cm)	Observer
Sept. 19.35	12.7	32R	JEB
Oct. 8.33	10.3	25R	CSM
12.00	9.7	30R	GSK
14.35	8.4	8B	CSM
18.02	7.7	5B	GSK
22.41	7.5	5B	JEB
31.17	7.1	5B	JEB

Table II (continued)

Nov.	1.39	6.8	5B	JEB
	3.40	6.8	8B	CSM
	6.41	6.7	8B	CSM
	13.42	6.5	5B	JEB
	18.23	6.6	5B	GSK
	25.26	6.6	8B	GSK
	26.44	6.7	5B	JEB

Comet Meier (1980q)

Rolf Meier's third comet was discovered on 1980 Nov. 6 with a 41cm reflector. JEB (32cm reflector) saw the comet at 9m.6 two days later while MJH secured a 31 min. exposure of the 4' coma (275027 km) with the 10cm f/4.5 lens at Colchester. A plate was also exposed by HBR using his 35mm f/4.5 Dallmeyer Serrac lens on Nov. 10.81. GSK used a 20x80B during midmonth to secure numerous estimates of the comet's brightness which was found to be 8.9 - 9.0 while the larger instruments used by JEB, CSM and RWP placed the comet at about 9m.6. Most observers agreed that the diffuse, ill-defined coma was a little condensed and about 3' across. GSK reckoned the coma to be rather assymetric or fanned to the northeast while a further photo by MJH on Nov. 12.79 recorded a possible tail in p.a. 355°. GSK also noted a possible faint tail to the east or northeast during the end of November.

By early December, the comet was beginning to sink rather low in the evening sky and most observers began to record a fade at this time. However, GSK's estimates continued to place the comet at 8m.8 - 9m.0 during the first week of the month when the coma was up to 6' across (493482 km) and by January the comet had brightened noticeably. GSK was surprised to find the comet as bright as 8m.4 when he recovered it in the morning with 20x80B on 1981 Jan. 4.26. The comet was quite extensive, being 7'.2 across (636044 km) while the 10x50B gave the magnitude as 8.2. Brighter estimates were also secured on this date by JS who used the 32cm refractor at Cambridge. Throughout January, GSK recorded the comet at similar brightness although by the month's end JEB recorded 8m.7 in 20x80B. The same value was found by GSK during early February.

During March, the comet appears to have gone virtually unobserved, presumably because of bad weather although it was again seen by JEB and GSK during the first week of April when both agreed that it was very diffuse and mag. 10.5. The comet was last detected by CSM with a 25cm reflector on May 8.16 when it was 10m.7 and 4' across (275027 km).

A total of 37 BAA estimates were used for the photometric analysis as follows: JEB(9), CSM(7), and GSK(21). The results of JEB were taken from the ICQ. The following parameters were found for the heliocentric arc r = 1.52 - 2.49:

$$H = 5.49 \ (\pm 0.31)$$

$$n = 4.13 \ (\pm 0.49)$$

The estimates were all corrected for a standard aperture of 6.78cm and a few sample results are shown in table III.

Table III Aperture corrected estimates. Comet Meier (1980q)

1980 Nov.	8.00	9.1	32R	JEB	Feb.	1.22	8.6	8B	GSK
	25.82	9.0	8B	GSK		13.43	8.9	8B	JEB
	30.98	9.1	25R	CSM	Apr.	5.16	10.1	30R	GSK
Dec.	6.77	8.9	8B	GSK		7.18	10.0	32R	JEB
1981 Jan.	5.24	8.5	8B	GSK		23.11	10.0	25R	CSM
	13.25	8.3	8B	GSK	May	8.16	10.3	25R	CSM
	31.43	8.6	8B	JEB					

Comet Panther (1980u)

This comet was well observed by members of the Section and 161 report forms have been received at the time of writing this report. A further 41 observations from our two experienced American observers John Bortle (JEB) and Charles Morris (CSM) have also been taken from the ICQ for the purpose of this analysis. The observations span 6 months during which time the

comet was well placed. The large volume of data which has been secured is particularly encouraging because the comet was never brighter than 8m.3. Probably the most pleasing aspect of the coverage is due to the fact that the actual discovery and a prediscovery photograph were secured by two of our most active U.K. members. Roy Panther (Walgrave) is to be congratulated for his visual discovery on Christmas Day 1980. The comet was discovered in Lyra during a routine comet search with a 20cm reflector at x35. In addition to the discovery, Mr Panther (RWP) secured a long run of observations. A prediscovery photograph by Jonathan Shanklin (Cambridge) has also come to light. A 5 minute exposure with a 50mm f/1.8 lens on 1980 Nov. 26.80 UT shows the comet at about 10m.3, near the plate limit. Jonathan Shanklin (JS) also secured a long sequence of observations primarily from Cambridge.

The discovery was checked visually by George Alcock (Peterborough) and MJH (Colchester) who also provided photographic confirmation on Dec. 25.8. A 10 minute exposure with the Cooke 10cm f/4.5 lens showed the coma to be 3' across (251180km) and mag. 9.5. Two days later, GSK found the comet to be reasonably bright at 8m.8 in 20x80B. The well condensed coma was fanned to be northwest with a 10' tail in p.a. 003° which was confirmed on a further plate exposured by MJH on the same evening. The larger reflectors used by GMH, RMcK, RWP and JS all placed the comet's magnitude somewhere between 9.0 and 9.5 during the end of December although, as the New Year began, JS and GSK both agreed the magnitude was 8.6 or 8.7 in 8cm binoculars. The latter observer found the coma to be 5'.5 across (444460km).

A number of observers were now beginning to report various tails generally orientated towards the north and northeast. A 10' tail in p.a. 005° was seen by GSK on 1981 Jan 1.26 while GMH and RWP also noted elongations in a similar direction on Jan 4. Between Jan 4 and 11 a 12' tail in p.a. 40° was visible in GSK's 20x80B and on the latter date an additional tail was seen to the north. The northward appendage was also recorded by DP with a 40cm reflector. Both JS and GSK estimated that the coma was 8m.5 in 8cm binoculars on this date.

On Jan. 16.21, JS observed the tail in p.a. 20° when he observed with the 20cm refractor at Cambridge although the following day it was seen for 15' in p.a. 350°. The position angle of the tail probably varied from night to night although several transient tails may have existed at this time. On Jan. 31.44 JEB (32cm reflector) and JS (20cm refractor) both observed the 15' tail in p.a. 340° while 2 days later GSK's 20x80B showed a diffuse tail between p.a. 0° - 30° and a narrow tail in p.a. 355°. There was also a possible jet in p.a. 52°, north east.

During early February, JS and RWP frequently described the coma as being extended with a straight narrow tail between p.a. 320° and 350° which was possibly as long as ½° on one occasion. The position angles recorded for this primary tail component compare favourably with the radius vector angle of 330° at this time. In addition to this primary component, CSM and GSK also noted tails to the northeast on several occasions. On Feb. 13.42 JEB saw the tail in 325° with a 32cm reflector while CSM's 20x80B showed two tails to the northeast in p.a. 18° and 30°. A few hours earlier GSK's 20x80B showed a narrow tail in p.a. 340° with two other straight narrow tails in p.a. 47° and 294°. Tail multiplicity seems to be well confirmed on the basis of these visual observations. From mid Feb. to the end of the month JEB, RWP, JS and GSK all reported the primary tail in approximately p.a. 310°.

At the beginning of March the coma was well condensed and about 6' across (365542km). On March 2, both JEB and GSK found the comet at 8m.3 in 20x80B. The comet moved to within 1° of Polaris on the night of March 12 and the position angle of the radius vector switched around as the comet's position relative to the NCP altered over the next few days. The primary tail was now located somewhere near p.a. 90° according to JEB and GSK. The tail was 7' - 8' long and persisted throughout the rest of March when it was also recorded by CSM. In addition to the main tail, GSK observed various other appendages to the east, south and west in 20x80B on Mar. 25.98.

Around this time, JEB, CSM and GSK all agreed the well condensed coma was 8m.4 or 8m.5 while its diameter was 5' (317674km). These values remained more or less constant until after the first week of April when a definite fade began to set in. On Apr. 6 and 7, JEB and GSK found the comet at

8m.6 in 20x80B and both observers continued to report the eastward tail as did CSM. Again on Apr. 2.82, GKS's 20x80B showed considerable development with two straight narrow tails to the south and west (p.a. 170° and 258°) while the primary component was located in p.a. 126°. The radius vector was now 108°.

By the end of April, the ninth magnitude object was 4'.4 across (374141km) in GSK's binoculars. on May 1.09 JEB observed the comet at 9m.7 with a possible tail in p.a. 45° as seen in the 32cm reflector. A similar brightness was found by CSM with a 25cm reflector around this time. Unfortunately the comet was becoming less favourably placed for U.K. observers who increasingly saw less of the coma and obtained fainter brightness estimates. When GSK last observed the object in binoculars on May 4.90, it was still around mag.9½ and 3' across (273635km) but a week later, the comet was found to be small and faint at mag. 11 in the larger reflectors used by GMH, RWP, JS and GSK. The observations were no doubt suffering from deteriorating observing circumstances as further results from JEB and CSM in the U.S.A. showed it to be substantially brighter and larger than indicated by U.K. observers during May. The U.K. observers who all placed the comet nearer mag. 11 during this period were only recording 1'.5 - 2'.0 of coma while CSM could see 3' (355229km) of nebulosity at 10m.4 with a 15cm reflector as late as June 3. Furthermore, both JEB and CSM reported the comet to have remained well condensed throughout May whereas from this country only the inner region could be detected and even this appeared weak and diffuse.

For the photometric analysis, these later observations are significant as the brighter results due to JEB and CSM in May indicate that the comet actually brightened as it receded from the Sun. Unfortunately the under-estimated U.K. values mask the overall effect. Fortyone estimates by JEB and CSM give H = 6.72 (±0.18) and n= 1.32 (±0.28) while 125 BAA estimates over the heliocentric arc r = 1.66 - 2.33 AU give H = 5.40 (±0.19) and n = 3.53 (±0.30). The following estimates were used: JEB-18, GMH-2, GSK-32, RMcK-1, CSM-23, RWP-20, HDR-7, JS-26. Table IV gives selected aperture corrected estimates of the comet.

Table IV Aperture corrected estimates. Comet Panther (1980u)

Date	m_v	AP(cm)	OBS	Date	m_v	AP(cm)	OBS
1980 Dec. 27.75	8.8	8B	GSK	1981 Mar. 13.10	8.4	8B	JS
1981 Jan. 1.26	8.7	8B	GSK	24.09	8.4	8B	CSM
4.75	8.6	8B	JS	Apr. 1.14	8.4	8B	JEB
12.79	8.5	8B	JS	2.92	8.5	8B	GSK
25.99	8.4	8B	JEB	7.12	8.6	8B	CSM
Feb. 10.23	8.4	8B	GSK	20.88	9.4	8B	GSK
14.41	8.3	8B	CSM	May 4.90	9.5	8B	GSK
28.01	8.4	8B	JEB	8.08	9.8	32R	JEB
Mar. 5.19	8.4	8B	CSM	24.10	10.3	32R	JEB
				Jun. 3.10	10.4	15R	CSM

P/Borrelly (1980i)

This comet was observed by JEB with a 20x80B at 9m.9 on 1981 Jan 25.05. The coma was 4'.5 across while the 32cm reflector gave values of 10m.4 and 2'.2. Further estimates by JEB until the month's end showed a slight brightening. At this point in time, the comet was considerably brighter than expected and MJG was surprised at the clarity of the well condensed image when he observed with a 25cm reflector on Feb. 1.78. Further observations by KEB and CSM during the first week of February placed the comet around 9m.5. On Feb. 10.81, GSK's 30cm spec gave 9m.8 while values near 10m.0 and 2' were recorded by JEB, CSM and GSK during mid-March. Towards the month's end, the comet was followed by KMS. As April began, further results were not being secured from the U.K. although JEB and CSM continued their work. A gradual fade to mag. 11 - 11½ was noted up to May. 9.

P/Schwassmann-Wachmann 2 (1979k)

This very faint object was not observed by U.K. members but a good sequence of results by JEB and CSM during 1981 Jan - Mar show the comet to have been near 12m.0 with a coma diameter of 1'. An unexpected dip to 13m.0 occurred at the end of Feb. although by Mar. 2, the comet had recovered to nearer 12m.0 again.

P/Schwassmann-Wachmann 1 (1925II)

An outburst of this object was reported by Merlin (France) on 1981 Apr. 22.85 and this was confirmed through T.A. channels by GSK on the following evening. The comet was then very small (0'.8) and 11m.2. The coma grew to 1'.1 by Apr. 25.96 when its mag. was still 11.2. Both GMH and GSK observed on Apr. 27.9, the former finding 11m.5 with a 25cm spec while GSK found 11m.8 with a 30cm reflector. Both observers agreed the coma was 1'.1 or 1'.2 across while GSK noted the coma to be elongated in NE/SW. On May 4 JEB, GMH and GSK all agreed the coma was 1' - 2' across at mag. 11.3 - 11.5. Further results by JEB show the comet to have remained at similar brightness until the second half of May, by which time the coma had expanded to at least 3' diameter.

Comet Bowell (1980b)

Observations of this object have not been easy due to its proximity to Jupiter. During the period 1981 Jan - June, JEB, CSM, JS and GSK found the comet to be near 11½m and 1' across. The comet should be visible throughout 1982 but low in the southern sky from the U.K.

References:

1. Morris, C.S., Publ. Astron. Soc. Pacific. 85, p506 (1973)
2. Whipple, F.L. and Sekanina, Z., Astr. J. 84, 1894-1909 (1979)
3. Green, D.W.E. and Morris, C.S., ICQ. 3, p10 (1981)
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PHOTOMETRIC OBSERVATIONS — Graham S. Keitch

With the next few comets we would like to establish specific standards for our photometric work in order to comply with ICQ requirements. This would also improve the value of our analyses. We hope to make our thoughts clear through the Journal, Bulletin and at the forthcoming Section Meeting, but meanwhile a few guidelines are given to assist observers to secure realistic estimates.

1. The I-O (In-Out) method is recommended for most comets while the O-O method and Morris method can be used where more applicable. The method must be stated.

2. Proper comparison stars must be used and quoted. Variable Star sequences and AAVSO Atlas are recommended. Guesses are only of value in exceptional circumstances. Use at least 2 comparison stars not more than 1 mag apart, with the comet in between, in brightness. Observers without comparison star data should submit sketches giving field size, orientation and preferably the stars 1950.0 position as estimated from an atlas.

3. Be sure to expand the stars fully to avoid underestimated values for the comet's brightness.

4. Use binoculars for comets brighter than 8½-9 mag. i.e. 10x50 or 20x80. When using a telescope for fainter comets, use the lowest power that will show the comet clearly, this usually results in an exit pupil of about 5mm, though higher powers will be required for very small, faint objects. Make simultaneous estimates with various instruments likely to be used for a given comet, but avoid unnecessary changes in instruments.

5. Look critically at your estimates as you go along so that you can identify and rectify problems (i.e. those caused by sequence errors) as they arise. Wild fluctuations should not appear in your estimates. Sudden outbursts or fades, whilst not rare, do not occur all the time! If an uncertainty greater than $\pm$ 0.3 mag. is considered likely, quote the estimate as approximately.

6. Send report forms to the Director as soon as possible please.