

BRITISH ASTRONOMICAL ASSOCIATION  
VARIABLE STAR SECTION

CIRCULAR No. 45

1980 DECEMBER

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## NEW MEMBERS

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## LAST SAE REMINDER

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C. MUNFORD      M. RATCLIFFE      P.B. TAYLOR      M. TURRELL

H.C. WILLIAMS      P. WITHERS      D.L. YOUNG

Reports of 1980 Observations

Once more the time has come for observers to be reminded about submission of reports for the past year. This time it is particularly important as there have been changes in the persons to whom observations should be sent. Will all observers please note that observations of binocular stars should be sent to Melvyn Taylor, those of eclipsing binaries to John Isles, while those of main programme stars and any other objects such as novae, should be forwarded to Greg Coady. We regret that it has not been possible to make a general issue of the computer-type forms as we hoped, so observers should complete old forms in the usual manner. (Those few observers who have been issued with new forms need not panic - the new forms are quite acceptable!) A Julian Day calendar (for more than just one year) and a reminder of methods of filling in the forms appear later in this Circular. Will all observers please reread the instructions regarding the number of decimal places required - a list is given of those stars requiring JD to 0.01. Please send in observations as early as possible, certainly before the end of February. For future reference a change in reporting procedure is being suggested and is described below.

Section Organisation and Future Plans

At a recent meeting of all the Section officers there was a very full discussion of the Section's methods and policy for the future. A number of priorities and alterations were unanimously agreed to be desirable to improve the operation of the Section. We are certain that these will be welcomed by the members and will be to everyone's advantage. Some of the points are as follows:

**Secretaries:** The use of the term 'Co-ordinator' has been dropped, and replaced by that of 'Secretary'. The persons concerned will be responsible for the individual sub-sections and will receive observational reports, as well as handling day-to-day matters.

**Programme:** No major changes in the Section's coverage are anticipated in the near future, especially since the Eclipsing Binary programme has been redefined [VSSC 44 p 8-9]. However, the Director and the Secretaries will always be pleased to consider suggestions for objects to be studied or possible changes. We are receiving help from a few members in obtaining photographs of variable star fields and anyone interested in this type of work is invited to participate. (Although the derivation of suitable visual magnitudes from photographs is often a problem, they are invaluable in enabling accurate charts to be drawn.) However, one of our greatest needs is for photoelectric photometry, and we should be pleased to hear from anyone with, or with access to suitable equipment.

**Novae/supernovae:** The only slight alteration in the programme comes with the amalgamation of the various nova and supernova programmes. Efforts by members of the BAA and JAS, and contributors to The Astronomer, will in future be integrated into a single search programme (with the formal title of 'UK nova/supernova search programme') supervised by Guy Hurst. Henceforth, it may be assumed, that the BAA will accept all observations of novae and supernovae, and will analyse and report upon all objects with reasonable coverage. Please note that this programme includes both visual

and photographic observations. Wherever possible Guy will issue preliminary charts upon discovery of the objects and these will be freely available to interested members. (A typical preliminary chart is enclosed for the supernova in NGC 6946.) We will be making efforts to try to issue this information as soon as practical after discovery and expect to be looking at the best methods of achieving this. When adequate information is to hand a final BAA chart will be drawn up, which will be available to members who may wish to follow the object in its final decline, or monitor it later. These 'definitive' charts will be permanently available for future reference. Further details of the nova/supernova search programme may be obtained from Guy Hurst at the address given on the cover. Please note that pending the installation of a home telephone, he may be contacted at the office telephone number given, during the daytime. In the case of possible DISCOVERY messages during the night, please phone either the BAA VSS Director or the TA Early Warning Team (Dave Branchett, Eastleigh (0703) 611748).

**Submission of Observations:** In future it is proposed to ask members to submit observations twice a year, in July and January, covering the periods Jan - Jun, and Jly - Dec respectively. This should have several advantages; observers will have less to prepare at any one time (and should find the time during light summer evenings!); the Secretaries' tasks will also be similarly eased; the information will be more rapidly available. The suggestion has been made that even more frequent reporting would be desirable, as is usual with many other observing groups. However, this is felt to be impractical for the time being at least.

**Preliminary Light-curves:** The light-curves recently issued have been welcomed by members, many of whom have commented specifically upon their value. It is our intention to make these a regular feature and we expect to produce some for certain binocular stars from 1980 observations, in addition to the Main Programme objects.

**Analyses and Reports:** It is a matter of great concern that most binocular observers have seen little in print about the objects which they are following. It is hoped that - at least for the more active stars - preliminary light-curves and summaries of activity will go part of the way to remedy this. Reports on some interesting stars are being prepared as a matter of high priority and may be expected to appear in the Journal in due course. These will include any relevant observations 'bequeathed' to the BAA from the Binocular Sky Society.

With regards to other stars, the series of reports upon eruptive objects which has appeared in the Journal in recent years will be continued, and work is beginning on the preparation of the next reports. The large backlog of observations of LPVs remains the greatest problem, but a start has been made upon a restricted analysis of some objects by hand methods and suitable reports will be prepared. These may be refined at some stage if computer assistance becomes practical.

**Computing:** It remains the intention to issue the revised forms as soon as possible and we apologise to members that this has not been done this year. However the forms will be generally available early in 1981 and all reports for next year should be entered on the new forms. A note of the method of completion, standard abbreviations, etc., will be prepared in a convenient form for easy reference and probably issued with the next Circular. Our trial run encountered problems in that it proved difficult to enter data from the old-style



forms and the observations are being transcribed. Storm Dunlop would be pleased to hear from any member (able to write fairly legibly!) who would be prepared to take small batches of observations and transcribe these into the new format. For the moment this would only apply to selected stars.

**Circulars:** Henceforward it should be fairly easy for charts and light-curves to be reproduced in the Circulars - a trial chart appears later, but is not expected to reproduce as well as future items - and we hope to present these regularly. As we occasionally have contributions from members, they might like to note that diagrams can be reproduced if they are drawn in black ink on white paper.

#### Supernova in NGC 6946

As notified in BAA Circular 611 and TA Early Warning Circular 42 (and also subsequently in TAEWC 44 & 45) a supernova was discovered by Wild (Astronomical Institute, Berne University) 280" east and 166" south of the nucleus of NGC 6946 which is located at  $20^{\text{h}} 34^{\text{m}}.4 + 59^{\circ} 56'$  (1950). At discovery the photovisual magnitude was 13. The galaxy, which is on the Cepheus/Cygnus border is of type Sc, and has a nominal magnitude of 11.1. It is very faint and large, being nearly face-on, and not readily seen visually except with the very largest telescopes. This galaxy has been the site of 4 previous supernovae, these being: 1917a, 1939c, 1948b, and 1968d. (The galaxy was one of the prime suspects listed by the UK Photographic Supernova Patrol - so there may be a moral here.)

Dr R. Wood of the Royal Greenwich Observatory has kindly assisted by measuring the sequence, and this preliminary sequence is given on the enclosed 'finder' chart, an intermediate field based upon the Palomar Sky Survey print (photocopied), and a close field (duplicated). [The photocopied charts have already been distributed to those members believed to be able to make full use of them; if any member with a moderate to large telescope was inadvertantly missed and could have used these charts, will he please contact Storm Dunlop who is compiling a reference list for future occasions.]

Photographic coverage of this object has been excellent. There may be predisccovery images upon photographs taken by Mike Swan, and several observers including Ron Arbour, David McAdam and Alan Young have subsequently recorded it. Alan Young, in particular, obtained a remarkable series of photographs on 14 nights during November, which with an image of about  $11^{\text{m}}$  on October 31, show a decline by about  $2^{\text{m}}$  by November 30. It is believed that the supernova is of type II.

Estimates should be sent to Guy Hurst as soon as possible, together with any photographs. In the latter instance negatives should be forwarded if possible, with written permission for these to be analysed at the RGO.

#### Nova in Sagittarius

IAU Circular 3533 announced that Honda had discovered a stellar object in Sagittarius at  $18^{\text{h}} 16^{\text{m}}.5, - 24^{\circ} 45'$  (1950). The object had a visual magnitude of about 9.0 on Oct 28.42 and was comparable in brightness on Oct 29 and 30.

A chart has not been issued as the location of this object was such that observation would have been very difficult at present. However if anyone has possible predisccovery photographs of the region, please send these to Guy Hurst - negatives again, please - who has a preliminary RASNZ chart available, based on that of V1016 Sgr, to aid analysis of photographs.

Ben Mayer reports from California that he has a predisccovery record of this object, but does not mention its date or brightness. We expect to see this material in due course.

#### Nova in Cygnus

As announced in BAA Circular 612 and TAEWC 45, Honda discovered yet another object on Nov 29.41841 [sic!], in Cygnus at  $21^h 40^m.7$ ,  $+31^\circ 15'$  (1950). It was reported as visual magnitude 10.0 and slowly rising. Observations of this object seem to be sparse, but observations by Dave Branchett, John Hosty and Guy Hurst on Dec 4 place it around 9.3, somewhat fainter than the pair of stars which are Np of the object (SAOC 071616 & 071620) which were used as comparisons, and have nominal visual magnitudes of 9.0 and 8.7 respectively. Photographs taken on Dec 13 and 14 by David McAdam show the object at a rather fainter magnitude, but in themselves raise an interesting problem. The exposures were made on HP5 film, without a filter, but the image sizes closely correspond with the SAO Catalogue visual magnitudes, but disagree with the photographic ones. The visual magnitudes are old ones from the Bonner Durchmusterung and are liable to be somewhat in error, and the stars are certainly not all of class A0, so the problem is compounded. Further photographs of the area, especially photovisual ones would be of great assistance. [It is interesting that Franklin-Adams chart 162 - taken 1912 Sep 2 from Johannesburg - shows an object on the very limit of the plate at the position of the 'nova'. Being so faint - presumably around  $13\frac{1}{2}$  to 14 mag. - and difficult to see on the print, the star is possibly slightly displaced from the exact location of the object reported by Honda, so again, large-scale photographs showing the faint stars would be of interest.]

#### T CrB

Included with the last Circular was a slip giving details of a possible outburst of the recurrent nova T CrB. Although the United Kingdom was almost completely clouded out, reports from other parts of the world where organisations have this object under regular observation, show that this was regrettably a false alarm.

#### Possible Occultation of S Scuti

Preliminary analysis suggests that S Scuti (a star on the Binocular Programme) may be occulted by minor planet 129 Antigone on 1981 June 5. Observers best placed will be those roughly along the 40th parallel in the eastern USA, but the preliminary track begins over southern Ireland, where telescopes will probably be required due to the fact that the Sun will not be far below the horizon. As always the predictions are subject to change at the last moment, and the track may be shifted considerably. However this should be enough warning for even the most farsighted observer who wishes to try to observe the event. [Preliminary information available from Storm Dunlop.]

#### An Organisation for Photoelectric Photometry

It was mentioned earlier that assistance with photoelectric observations would help the Section, and any members interested in this field should note that a group has been formed to encourage such work. The International Amateur and Professional Photoelectric Photometry - IAPPP - is open to anyone engaged in, or just interested in, photoelectric work. A quarterly 'Communication' with full-length papers will be issued. Annual membership is \$10.00, and the IAPPP may be contacted via Mr Russell M. Genet, Fairborn Observatory, 1247 Folk Road, Fairborn, Ohio 45324, USA. [Further details from Storm Dunlop.]

### Report of Lincoln Meeting (cont.)

In the foyer to the Lecture Theatre there was a display of work by the VSS. This showed all the light-curves for main programme stars observed in 1979, these plots having been prepared by Doug Saw; descriptions of the stars on the Binocular Programme with some light-curves prepared by Tristram Brelstaff and Melvyn Taylor; examples of the Section Circular, together with piles of charts and report sheets for the use of members.

### Infrared Studies of Novae and Pulsating Stars - Dr M.F. Bode

After a break for tea Dr Mike Bode of the University of Keele described some of his work involving infrared studies of novae and pulsating stars. Infrared excesses could be interpreted in several ways and in studying novae Dr Bode was looking into the effects of heating and cooling of clouds or discs of grains around the binary systems. He presented studies of V603 Aql, V1500 Cyg, DQ Her, R Gem, NQ Vul and the SN in M100. In general the visual light-curves were anticorrelated to the IR and UV fluxes. The use of good visual results was therefore complementary to those from IR and UV work for use in deriving suitable models for various stars. At long wavelengths IR radiation is being detected from clouds of grains heated to temperatures of about 1000 K by energy from the nova 'explosion'.

In order to avoid the absorption by water vapour in the Earth's atmosphere which severely limits detection of IR wavelengths, the new UKIRT (United Kingdom Infrared Telescope) has been built at an altitude of 4300 m on Mauna Kea in Hawaii. Dr Bode showed slides of this 3.8 m 'flux collector' both under construction in Sheffield and on the mountain. Typically the wavelength of the IR radiation being examined would be  $5\mu\text{m}$ . At the other end of the spectrum UV radiation in the region of 100 nm is being monitored from the newly launched IUE (International Ultraviolet Explorer) satellite, which is placed well above the atmosphere.

In novae several distinct phases of evolution are apparent, and Dr Bode described the development of a large IR flux at a time near the transition period, i.e. at a time when a changeover from a stellar to a nebular-like spectrum occurs, and when visual light-curves 'classically' show a sharp decline and later recovery, or significant oscillations. It was possible to calculate model light-curves and spectra for nova sources surrounded by grains and Dr Bode showed how his calculations agreed with observational data by Hyland and Neugebauer. Characteristic features were evident indicating dust grains at a temperature resembling that a blackbody at 800 - 900 K.

Apparently the rising effective temperature of the 'pseudo-photospheric' radiation from the nova reaches the point at which pre-existing grains absorb radiation at UV wavelengths and re-emit it in the infrared. Characteristically the temperatures and behaviour of the observed flux suggest that the grains are of carbon in the form of graphite, and probably rather smaller than usually inferred - possibly about  $0.01\mu\text{m}$  in diameter.

[In the discussion, Dr Bode said that it had been the general view that grains actually condensed from the ejecta of an outburst, and caused the observed phenomena. However there were a number of grounds for believing that this was unlikely, and certainly in novae it was possible that the grains had formed subsequent to an earlier outburst. It was largely a case that observations at as many wavelengths as possible should be obtained - and here early recognition of a new nova was vital - in order to try to distinguish between the various theories.]

On Saturday evening, the President of the Lincoln Astronomical Society said a few words of welcome to the Section members. He said that as it was the 21st anniversary of the local society's foundation, it had been felt appropriate to invite the BAA to hold some meeting in the city. He was delighted that one of the most thriving of the active Sections had been able to accept the invitation, and that the weekend should be such an obvious success. Mr J.L. White, the BAA President then gave a brief vote of thanks to the Lincoln Society and to those VSS members who had worked to organise the weekend, mentioning the Assistant Director, Storm Dunlop and Richard Pennell. He said that the Section had always offered something for everyone, beginner or advanced worker, and that he was certain that it would continue to grow in strength in future. He then introduced Mr Colin Ronan, who spoke on a subject of interest to both the Section members and to the local nonspecialised astronomers who were present - 'The Origin of the Telescope'.

Mr Ronan's lecture, a feast of inspired, literary detection was quite obviously enjoyed by all. "Nobody knows who invented the telescope" were his opening words and the fascination with the subject continued to the end. A large number of persons could be said to have contributed in some way, and some of these such as Hans Lippershey, Jacob Metius, Zaccarius Jansen, Galileo, Robert Grosteste, Roger Bacon, John Dees, Thomas Digges, Leonard Digges, Thomas Harriot, William Born, Tycho Brahe, as well as others were discussed in detail by Mr Ronan, who wove the various threads into a overall picture. However the final thread could not be found, so the answer to the question posed by the title of his talk could not (yet) be definitely answered. The last slide set the audience thinking. This was a portrait of Tycho Brahe which apparently shows a refracting telescope, and which could possibly hold the clue to further clarification of the matter. This portrait had quite possibly belonged at some stage to the 1st Astronomer Royal, John Flamsteed, as although the history of the painting could not be fully verified, the present owners, the Royal Society, did have a record of being presented with a portrait of Tycho by Flamsteed. If analysis could show whether the telescope shown was original or a subsequent addition, the question of the date and origin of the telescope might be nearer solution.

Sunday, July 6

'Practical V.S. Observing' - Andy Hollis

The morning session began with Andy Hollis presenting some of the methods which he used for observation. His first point was actually to appeal for some help by variable star observers for planetary workers who were having some problems with the study of the variability of planetary satellites, notably those of Saturn, and in particular Iapetus. Lack of suitable comparisons was the main problem as intercomparison between the satellites was complicated by the wide range of magnitudes which these covered. Perhaps here was a case for the use of some form of photometer.

For determining sequences and magnitude differences, Mr Hollis uses the photographic techniques employed by the late Walter Pennell - an 'unsophisticated' camera with a 50 mm, f/2 lens and W8 filter on a portable equatorial drive - for widefield photographs. For such purposes a clock-powered drive was adequate when used with a short-focus lens. By standardising the film/developer combination



and by measuring the image diameters, it is possible to plot image size against magnitude (with a few known points). From this a magnitude sequence could be calibrated for other stars. In some cases it was possible to measure the image widths on photographs where the stars had trailed. A suitable method is to project the negatives onto a screen set at a fixed distance. Experiments with a 75 mm f/4 lens showed stars down to magnitude 10 with one minute of driving and without a filter. A 500 mm lens guided by the main telescope allowed 12 mag stars to be photographed. Mr Hollis showed several slides demonstrating various experiments which he has carried out.

[During the discussion which followed several useful points were raised. Mr Hollis stressed that accurately figured mirrors and good quality eyepieces were needed to obtain the maximum light-grasp and contrast, for a given size of aperture, to ensure that faint stars could be seen. He also commented that if a rotating eyepiece end is used on a reflector, then this had to be accurately machined to ensure that it remained completely centred on the optical axis in all positions otherwise the images would be degraded. This could prove a difficult piece of construction to the unwary. Mr M.J. Maunder said that suitable high-powered magnifiers could be used for image measurement, and that these would cost in the region of £15. The use of a travelling microscope was proposed as helpful in measuring trailed images - possibly those of flare stars in particular - but its cost would normally be prohibitive for most workers, although the mechanically adept might be able to modify equipment to the same end. Dr Andrews pointed out that it was important to remember to pay attention to lens quality in both the taking and examination system, for example it was essential to take into account the effects of image differences over a wide field of view. One member pointed out that many of the problems of dewing could be overcome by using suitable pieces of block polystyrene, but that attention should be paid to the problems of vignetting by any long dew cap to a lens or telescope. Mr A. Dowdell reminded members that if they were intending to buy a camera which would have astronomical use, some modern 35 mm models were dependent upon battery power for the mirror lift, so that after a short period of a time exposure the battery could become exhausted, the mirror drop and terminate the exposure, unbeknown to the photographer!]

#### Flare Stars - Shaun Albrighton

Mr Shaun Albrighton discussed flare stars and the possibility of forming a nucleus of interested observers within the Section. Flare stars can be categorised into 3 main groups; (1) BY Draconis type, (2) 'flash' variables and (3) UV Ceti type. The BY Draconis variables are believed to have areas on their surface of lower brightness ('spots') and may thus show changes in their apparent brightness as the star rotates. In the second category are the many mainly faint (mag 13 to 21) red dwarf stars found in the last 20 years. An absolute magnitude of about +13 is typical for these. UV Ceti itself was discovered in 1947 by Carpenter and is the fainter companion of a dwarf double star with a spectrum dM5.5e. Other notable northern hemisphere flare stars are DO Cephei (10.3 - 11.4 v) and EV Lac (8.3 - 11.8).

On the Binocular programme there are two possible flare stars, BD +31 1048 (Auriga) and 66 Ophiuchi (= V2048 Oph). Normally the first, otherwise known as Andrew's Star, is about magnitude 6, but on 1964 March 1 it was noted that it was magnitude 3 when discovered by Dr Andrews at Armagh. In about one hour it faded

back to its normal state. Unlike other flare stars this object is very early, being class B, and the possibility exists that there is a late (M) companion to the star of magnitude 6. Mr Albrighton's visual estimates of the star (over 100 of them) suggest small amplitude variation and he has observed flares of about 1 magnitude, which however, unfortunately remain unconfirmed. New Zealand observers had reported a flare of 66 Ophiuchi in 1979, and more recently activity had been seen by Mr M. Bell and the speaker. Amateur observing techniques, said Mr Albrighton, are different to normal variable star estimating procedures. For those members who might be interested in watching such stars, possibly the best visual approach (in the absence of intensive photoelectric coverage) would be for independent observers to estimate the stars every 5 to 10 minutes during a special session. Alternatively the stars and their relevant comparisons could be watched for sustained periods say 10 to 15 minutes, again on mutually agreed dates. There was also the possibility that meteor observers and those searching for novae, as well as the usual variable star observers, might see flares, and one advantage of photography would be to confirm a flare by objective methods. The speaker said that he would like to see a flare confirmed by two or more observers, not only of the two bright stars mentioned, but also of others which might be of interest to members.

[An article on flare star photography can be found in JBAA 79 (1) 26 (1969). This describes successful techniques used by Arthur Page in Australia, and should be of considerable interest to members interested in this form of work.]

(Report to be concluded in next issue.)

#### Co-operation with overseas observers

We are already working with various groups and individuals located overseas. Observations of southern stars, for example, are being combined with those obtained by the RASNZ for common reporting and analysis. We receive a number of observations from individual observers who do not form part of any national group, or who observe stars not on other organisations' lists. We are very happy to do so, and would point out to observers who do not have contact with any group that they might like to consider forwarding observations to us which are not likely to be reported elsewhere. Although we believe that the extra information which BAA members provide is of assistance in many cases, observers need not feel that they should change their observing methods or method of reporting. We already receive observations which are limited to date, time and deduced magnitude, and these often are of great use in filling gaps in our coverage.

#### Co-operation with other BAA Sections

Mention is made in the Lincoln meeting report of assistance required by the Saturn Section, but members might like to note that the Comet Section is also interested in obtaining suitable charts and magnitudes (primarily for expected cometary returns) and is indeed working with the Dutch Group to this end. In addition, the Terrestrial Planets Section is hoping to begin work on minor planets and they also will require charts and sequences.



A Reminder about Filling in Report Forms

Please:

- 1) Record the chart used.
- 2) NAME the month in the date column for the first obs. each month.
- 3) Give last 3 digits of JD only (unless the 'thousand' digit changes).
- 4) Give the correct number of decimal places - generally eruptive stars only will require 2 places, LPVs, SRs, etc. needing just one.
- 5) Note that the correct methods of recording estimates are:  
 Fractional: A(1)V(1)B  
 Pogson: A-1, B+1 (NB these are two independent estimates)  
 Argelander (if ever used): A(1)V, V(1)B (NB again two independent estimates)
- 6) The correct method of recording 'fainter than' is '<', e.g. < C - or in the 'ded. mag.' column < 10.3.
- 7) Deduced magnitudes are required to ONE decimal place, followed by  $\pm$  for a class 3 estimate.
- 8) Please note that 'Class' digit applies to the accuracy of the ESTIMATE, not to that of the deduced magnitude.
- 9) Enter non-standard instruments in the 'Remarks' column, together with any comments. Comments on comparison star magnitudes should be made here also, but please send a separate note about these to the Director.

Sample Form: (numbers preceded by \* refer to notes above)

Observations of: AB Draconis  
 Observer: D.R.B. Saw  
 Location: Aylesbury, Bucks  
 Instrument: 350 mm Sp. Chart: VSS 195377 \*1

Sheet No. 1 of 2

Year: 1976 (Don't forget the year!)

Date	Time GMAT	J.D. & Decimal	Estimate	Ded. Mag.	Class	Remarks
*2 { Jan 3	6.50	781.29 *4	= E	12.3 *7	1	
Feb 25	7.30	834.31	E(1)V(2)G *5	12.5	1	
Mar 1	7.05	839.30	L-2	13.8	1	
2	8.05	840.34	< G-3 *6	<13.2	2 *8	Haze *9
5	7.25	843.31	< G-1	<13.0 $\pm$ *7	3	Moon

Note that month need not be repeated