

BRITISH ASTRONOMICAL ASSOCIATION

VARIABLE STAR SECTION

CIRCULAR No. 29

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Changes of Office

John Isles has had to resign the office of Section director, and Ian Howarth has been appointed his successor. John master-minded the revival of the Section, and we are fortunate that we are not losing his talents altogether, since he is staying with us to produce the projected Memoir on Mira stars. All matters concerning LPV's should continue to be addressed to him.

Quite independently Alan Pickup has resigned his post as BG Co-ordinator. DAP's extensive work on the preparation and revision of BG charts should not go unsung, and we are sorry to lose him. Alan Smith is now co-ordinator; he will deal with all BG matters, and hopes to establish a separate BG Circular. Contributions should be sent to him at the address on the cover. Alan Pickup's important 'Chart and Sequence Notes' will continue under the supervision of Melvyn Taylor, although they may eventually be incorporated in the BG Circular. The next CSN is due in April; those interested in receiving it should send Melv (address on the cover) an SAE in good time. He would also appreciate comments on any BG sequences.

Finally, Guy Hurst has agreed to deal with all Nova Patrol matters. As many readers will know, Guy already organises a very effective visual and photographic patrol, and further details will be given in the next VSSC. Being more easily accessible than his predecessor, Guy should be able more readily to promote interest in searching for novae.

The other Section officers have all agreed to stay on at their posts; the director is particularly grateful that the Section stalwart, Doug Saw, has expressed his willingness to stay on as Secretary. The director hopes that Section members will address queries and comments to the appropriate officers; the less correspondence he has, the more efficiently he can deal with it!

Submission of 1976 Results

Observers are reminded of the note regarding submission of observations which appeared in VSSC 26, warning that delay could prevent observations being used by the VSS. Any outstanding reports should be sent IMMEDIATELY to Doug Saw or Alan Forno, as appropriate.

Recent Novae

Nova (now designated NQ) Vul 1976 was mentioned in the last Circular. As widely predicted, it underwent a sharp fade in early January, to magnitude 12; latest results suggest that a slight rise may have set in. The general pattern of behaviour closely resembles DQ Her, although the fade was not nearly so deep as in that star. On the other hand, the drop to secondary minimum was much faster than that seen in XX Tau. Certainly the star merits close attention; extended charts and sequence (three sheets) are available from Steve Anderson.

Most readers will know of John Hosty's discovery of Nova Sge 1977 on Jan 7, at mag 7.2. The star would seem to have been caught post-maximum, as a rapid fade (to 11th magnitude by the end of Jan) set in at once. A preliminary chart is obtainable from Steve Anderson; an extended sequence is not yet available, so observers should carefully identify any comparison stars they may use, for subsequent reduction.

Short-period variations in a not-so-recent nova, V1500 Cygni, were noted shortly after discovery. Current photoelectric observations show the period of these variations has dropped to ca. $0^d.13$, while the amplitude has grown to ca. $0^m.4$ in V, and so should be detectable visually. Observers with adequate aperture and enthusiasm might like to try runs of observations.

T Coronae Borealis

An observation by the American variable star observer Leslie Peltier has provided crucial evidence in favour of a new model of the recurrent nova T Coronae Borealis. This nova had an outburst which reached second magnitude in 1866 and then faded back to magnitude 10. For many years Peltier made regular observations of this star and was very unlucky in failing to discover the second outburst which occurred in 1946. However, 260 days before the outburst Peltier observed the star to dip from its normal magnitude of 9.8 to 10.8 and then slowly recover over several months.

To understand the importance of this observation we must consider some of the peculiarities of T CrB as compared with other novae. The accepted model of novae is that they are close binary systems consisting of a normal main sequence star and a white dwarf star. The white dwarf is a star which has used up all its nuclear fuel. Were it alone in space it would be destined to slowly cool down and fade into obscurity. However, in a binary system mass exchange occurs, and the white dwarf constantly accretes hydrogen-rich material from its companion. When sufficient hydrogen has accumulated on the white dwarf the pressure and temperature reach the levels at which nuclear reactions can take place and a 'thermonuclear runaway' occurs giving rise to the nova outburst.

T CrB is also a binary system but of a different type. One component is a red giant and the mass of the other appears to be well above the Chandrasekhar limiting mass for white dwarfs. If there is no white dwarf in the system, then the standard, nuclear burning model of nova outbursts, described above, cannot be applicable, and some other mechanism is necessary to explain the outbursts.

In the new model of T CrB proposed by Dr. R.F. Webbink (Nature 262, 271 1976) the binary system consists of a red giant and a main sequence star. Theoretical studies have shown that the red giant is unstable in such a situation and will eject material in bursts towards the companion. When the ejection occurs the luminosity of the red giant is expected to drop suddenly and it is this effect which Peltier seems to have observed. The gravitational energy released when this blob of material falls onto the main sequence star, several hundred days later, then gives rise to the outburst. The model appears to be capable of explaining the detailed form of the outburst light curve with its sharp primary maximum followed by a smaller slower secondary maximum.

Since the red giant component provides most of the visual light at minimum it seems impossible to explain the dip observed by Peltier except in terms of an instability in the giant. The observation thus provides strong support for a model of this type.

The Faintest Variable Star

A joint team of British and Australian astronomers have found the faintest star ever observed. The object is the pulsar PSR 0833 -45 in the constellation of Vela. The Vela pulsar has been known for some time to emit radio pulses with a period of 89 milliseconds and is one of many such objects discovered by radio astronomers. Previously however, only one pulsar, that in the

Crab nebula, has been seen by optical telescopes. Since the Vela pulsar appears to be similar to the Crab in many ways, it was an obvious candidate for observation, but previous attempts to detect it optically had had no success.

The new discovery was announced by Dr. Derek Jones at a meeting of the Royal Astronomical Society on Feb 11th. It was the result of cooperation between the Royal Greenwich Observatory, the Anglo-Australian Observatory and Australian radio astronomers. In order to find such a faint object it was necessary for the optical astronomers to know exactly where to look. The accurate position of the pulsar was measured by Australian radio astronomers. Then under the control of its sophisticated computer system the 150 inch Anglo-Australian telescope was guided to precisely the same position. Even in this huge telescope the pulsar was 500 times fainter than the background light from the night sky which passed through the five arc second aperture used for the observation. It was necessary to add together eight hours of data, recorded with a sensitive photoelectric photometer before the pulse could be picked out. The pulsar light curve appears to show a double pulse every period. A similar double structure has been observed in gamma ray pulses from this object. The magnitude of the pulsar, averaged over the pulse period, comes out to 25.6.

R Coronae Borealis

M. Hapgood and R.M. MacLeod have both reported a suspected fade in this star.

Members List changes and additions:

BRELSTAFF, J.T. Address changed to: Lyddon Hall, Virginia Road,
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R.M. MacLeod, B.N. Marchant, R.J. Marshall, L.R. Mathews,
A.B. Scott, R. Steer, C. True.