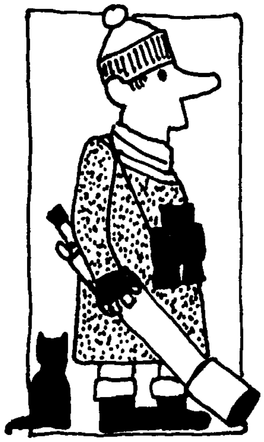

The Variable Star OBSERVER

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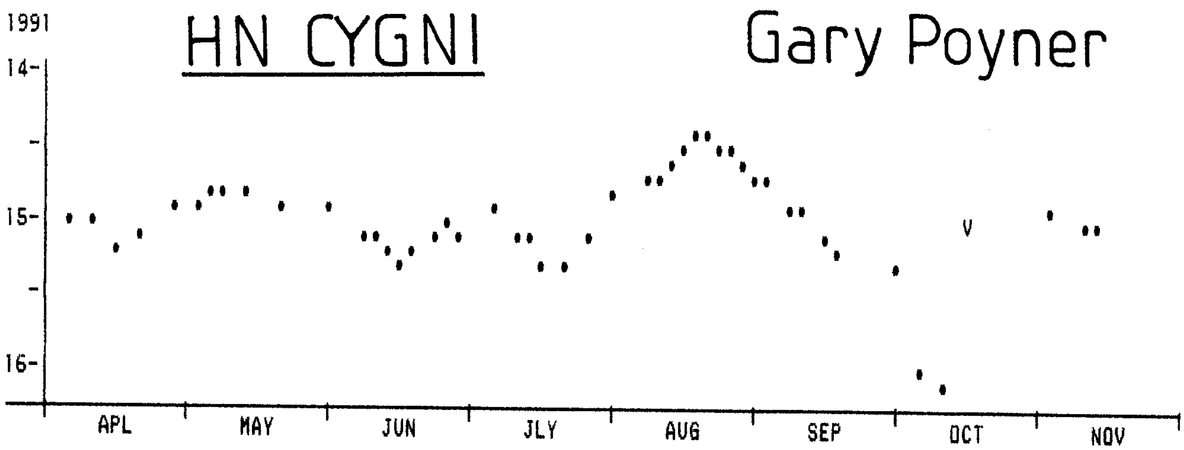

HN Cygni

In the 1985 GCVS, HN Cygni is listed as a possible dwarf nova with a photographic range of 13.3 - 16.0. However, in IBVS 3496, Munari et al give its spectral type as M6.5 and suggest that it is really a Mira variable. Gary Poyner has been observing this star for the past two years using his 40cm reflector. The comparison stars he used were taken from a photographic sequence. The above light-curve shows his results for 1991. These indicate that HN Cyg is neither a dwarf nova nor a Mira star but is probably a semiregular variable. This confirms the results of I.L.Andronov in IBVS 3613 which also suggest that it is an SR star. Until recently, HN Cyg was on the VSS/TA Recurrent Objects Program run by Guy Hurst.

The VSS Centenary Meeting (Continued)

The highlight of the Sunday afternoon was undoubtedly the talk by **Dr Janet Drew** of Oxford University, entitled "**DX Andromedae - Towards new insights on binary star evolution**". Back in 1989, her group at Oxford had booked some observing time on a satellite-borne ultraviolet instrument. They were interested in studying stellar wind phenomena in dwarf novae. DX And had, up until then, been rather poorly studied but they decided to look at it when an alert from the AAVSO indicated that it was going through one of its relatively infrequent outbursts during one of their observing sessions. Dr Drew stressed the point that if it hadn't been for this tip-off from the amateurs then none of the following work which she was to describe would have been carried out. As it turned out, DX And was found to be particularly suitable for the work they intended, and they have been subjecting it to close scrutiny ever since then.

However, before describing their work at Oxford, Dr Drew gave an outline of current ideas on the origin and evolution of cataclysmic variables (CV's). CV's are close binaries which normally consist of a white dwarf and a main-sequence star. Their orbits must originally have been wider than they are now because, in the past, the white dwarf must have been through a red giant phase and a larger orbit would have been required to accommodate both of the stars. As the red giant expanded, the main-sequence star would have started to experience drag caused by the outer layers of the red giant. This would have caused the main-sequence star to slowly spiral in towards its companion. As it got deeper into the atmosphere of the giant, it would cause the atmosphere to heat up. Eventually the atmosphere of the red giant would be expelled altogether, leaving just the core of the red giant - a white dwarf star. The time during which the main-sequence star is orbiting within the outer layers of the red giant is known as the Common Envelope Phase. This phase leaves traces of material from the red giant in the outer layers of the main-sequence star. Studying the elemental abundances in the main-sequence component of a cataclysmic binary can thus give information about the elemental abundances in the red giant component when it went through the common envelope phase.

The future evolution of CV's is much less clearly understood. Their periods should continue to shorten but there is great uncertainity in how the mass of the white dwarf will develop in the long-term. Do they accrete material faster than they lose it in nova outbursts? At the present, no one knows, and the evolution of the whole binary system depends crucially on the answer to this question.

Dr Drew then went on to describe the Oxford group's observations of DX And. In their first UV observations of the November 1989 outburst, they were looking for spectral variability in the UV. Relatively little was known about DX And at the time. No one had determined its orbital period, but the star was known to be quite reddish at minimum, and outbursts occurred at a rate of about one per year (1985 GCVS details: type UGSS, range 10.9 - 16.4p, period 214d). The UV observations revealed periodic variations which probably resulted from orbital motion. These yielded a period of 10 to 11 hours. In addition, a broad absorption feature at 2200Å enabled them to get a good estimate of the reddening due to interstellar absorbtion. The derived colour excess of 0.2m, in that part of the sky, implies a distance of about 650pc. Later, optical studies have shown that the main-sequence star contributes almost all of the light of the system at minimum. This made DX And particularly suitable for one of their projects to determine the spectral type and rotational velocity of the main-sequence components of CV's. In the case of DX And, the spectral type was found to be K1V or K2V. This was confirmed by comparing the energy distribution in low resolution spectra with standard spectra. This gave it as being between K0V and K4V. The spectrum shows several anomalies which are probably due to emission from the accretion disc around the white dwarf. In addition, there are several features which can only have been produced by the s-process nuclear reactions which take place in an asymptotic giant branch star. This gives some indications as to how the common envelope phase took place.

The next speaker was **John Howarth** of the Crayford Manor House Astronomical Society who gave an account of the **Hewitt Camera Archive.** This had recently been handed over to the CMHAS for safe keeping as it was no longer needed at the RGO. The Hewitt Cameras had originally been designed for tracking the re-entry of 'Blue-Streak' but after the rocket was scrapped they were turned over to tracking artificial satellites. About 11,000 plates, each 10°x10°, were taken between 1966 and 1990. Although the star images are trailed, they show stars to about mag 11. Most of the plates were taken from Herstmonceux but, between 1983 and 1989, quite a lot were taken from Siding Spring in Australia. One of Mr Howarth's first jobs was to create a computerised index of all the plates. He demonstrated this to the meeting, and explained that most of the data-entry work had been done by wives of CMHAS members. As well, as the plates, the CMHAS were also given a Zeiss plate measuring machine.

Andy Hollis then described his experiences in **photoelectric photometry.** He has a twin-telescope PEP set-up at his observatory at Marton Green in Cheshire. Using two telescopes simultaneously gives several advantages over single-telescope PEP. Not only can observations be made more rapidly (over twice as fast), but reliable results can be obtained under worse conditions (over 3 times as many usable nights). He had problems with dew affecting the telescopes in different ways, but this had been cured with a hair-drier. He stressed the need for continual checking and said that you should never just assume that things are going well when you can check that they are.

Roger Pickard then spoke about the **Ells' Automatic Photoelectric Telescope.** Since Jack Ells' death this has been out of action but, now it has been handed over to the CMHAS, it may be back working again soon. **Jindřich Šilhán**, of Brno in Czechoslovakia, then gave a brief description of a database of 100,000 eclipsing binary minima which is being compiled by the German group, the BAV.

John Isles used his **closing speech** to sum up what had been learnt from the meeting. He said that the amateurs should be pleased to note that the professionals are finding our work useful. They should carry on doing what they are already doing, and maybe publicise their work more. The VSS might consider adding XX Oph, the possible recurrent novae mentioned by Nye Evans, and V509 Cas to their program. In this country, amateur PEP has not made much progress, at least in terms of results. There is probably a need for more photometers. Maybe the BAA of the RAS help with the purchase or loan of some? Does the VSS need a separate PEP program? Probably not, as there are plenty of suitable stars already on their Main Program. John then re-emphasised the need for help in keying-in observations if the computerisation is to progress. He then turned to what the professionals could do. First, there is the need for feedback - they should tell the amateurs if they are using their observations or, if they are unsuitable, then they should say why. They can make suggestions as to what should be included in the VSS program (bearing in mind the limited equipment available to amateurs). Above all, the professionals should take the trouble to find out what amateurs are doing and are capable of. "If the professionals show an interest in amateur work then the amateurs will be spurred on to become more professional". Together, the professionals and the amateurs can work out the best way to archive the amateur data and how to publicise its availability. They can also work together to draw up a code of practice to guide professionals in their dealings with amateurs.

The Colours of Comparison Stars
By Tony Markham

Guides to variable star observing often stress the desirability of choosing comparison stars that are of a similar colour to the variable and point out the errors that can occur when comparing the brightness of a red variable with that of a white comparison.

Charts provided by the BAA VSS, however, do not give the spectral types of the comparison stars - indeed many charts do not even give the spectral type of the variable ! Observers might assume that the comparisons have been carefully selected so that they are of the same spectral type as the variable. The table below, in which the spectral types of comparisons have been obtained from the Atlases Borealis and Eclipticalis, show that this assumption is often incorrect.

UU Aur Spectral Type N3

Comparison	A	B	D	E	F	G	H	J	K	L	M
Magnitude	50	51	528	571	606	624	633	66	67	69	71
Spectrum	K	K	OB	K	A	G	F	K	A	G	F

RY Dra Spectral Type N4

Comparison	B	D	E	H	P	R	W	Y	3	4	5	6
Magnitude	53	55	57	61	66	67	70	71	75	75	75	76
Spectrum	A	G	K	OB	K	K	A	G	F	F	A	K

TX Dra Spectral Type M4

Comparison	G	F	H	K	L	M	N	P
Magnitude	64	66	67	72	72	77	79	83
Spectrum	K	A	A	K	OB	A	K	G

TV Gem Spectral Type M1

Comparison	A	C	B	D	F	E	G	L	K	M
Magnitude	59	615	625	625	70	72	765	80	805	835
Spectrum	OB	G	K	OB	OB	K	G	K	OB	G

X Per Spectral Type 09.5

Comparison	F140	F142	W	Y	A	B	Z	C
Magnitude	504	510	548	573	61	623	636	66
Spectrum	OB	A	OB	OB	A	F	OB	K

Although there are comparisons of the same spectral class for the blue-white X Per, the same is not true for the red variables. Although red stars are very common, most are of low luminosity and many of the remainder are variable. Thus there will often be no suitable red comparisons near a red variable. Thus, when observing a red variable, it is advisable to assume that the comparisons are NOT of the same colour as the variable and to be very careful to avoid errors - for example as a result of prolonged staring at the variable.