

Novae Observed at La Silla

H. W. Duerbeck

Few astronomical events receive as much attention by amateur astronomers as the appearance of new stars in the sky, i.e. nova outbursts. Many novae are discovered by persistent sky watchers far from the large observatories and it is only somewhat later that these spectacular astronomical events come to the notice of professional astronomers through the telegram service of the International Astronomical Union.

Dr. Hilmar W. Duerbeck of the Hoher List Observatory near Bonn in the Federal Republic of Germany has observed several novae from La Silla.

Certainly no astronomer will provoke the complete rejection of his application for observing time by proposing that he would like to observe a nova outburst. On the other hand, an observer may hopefully change his original programme somewhat when such an unpredictable event takes place.

During fairly long observing runs in 1975 and 1976 the writer has experienced the feverish activity when an IAU

telegram with the news of a nova outburst arrives. In 1975, Professor Walter (Tübingen) entered the astro-office on La Silla one afternoon with a Xerox copy of such a telegram and said "we must observe this", and started to prepare finding-charts for the X-ray nova (=V616) Monocerotis. The UBV observations that were made with the ESO 50 cm telescope in the following weeks gave the first indication of a brightness variation with a period of 4 (or 8) days, obviously caused by the orbital motion of an exotic close binary star (*Astr. Astrophys.* **48**, 141 (1976)). This periodicity was later confirmed through X-ray data and photoelectric observations made from La Silla about half a year later (Chevalier, Ilovaisky and Mauder, *IAU Circ.* 2957 (1976)).

Nova Mon 1975 was unique among the novae known at that time, and it is certainly not a "classical" nova with an expanding shell. The discovery of a very similar object only two years later (Nova Ophiuchi 1977, H1705-25) indicates that a new class of variable stars, "X-ray novae", might be established in the near future.

In the autumn of 1976, the discovery of a nova in the constellation Vulpecula was reported. It was not a favourable object, in the evening sky, for La Silla. Nevertheless, a fairly long series of UBV observations could be obtained with the ESO 50 cm telescope. Nova NQ Vul exhibited a rather irregular light curve during outburst. It initiated a general study of the behaviour of novae in the two-colour diagram, from the early stages, when the emission lines are weak

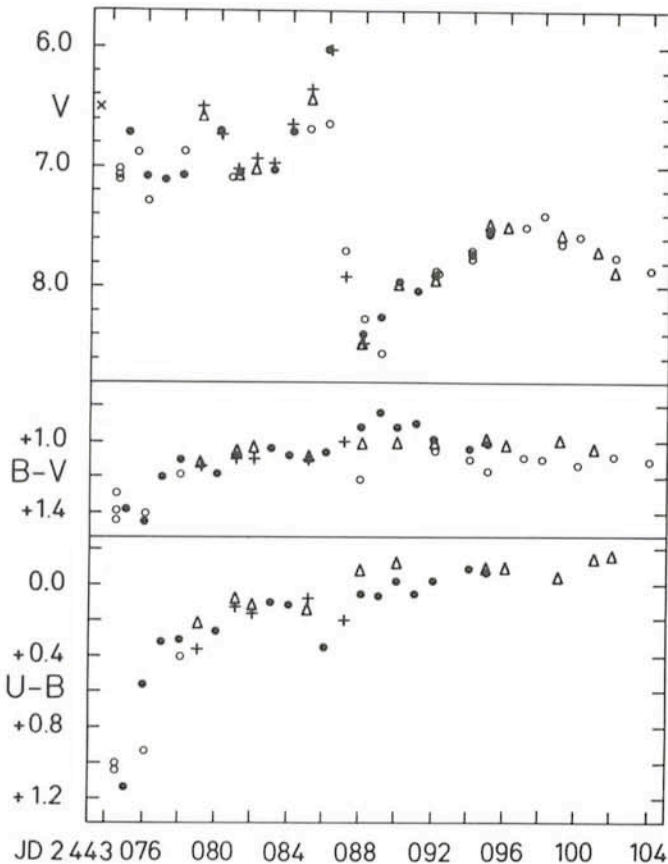


Fig. 1. — UBV light curves of nova NQ Vul (1976). The large dots are measurements obtained with the ESO 50 cm telescope.

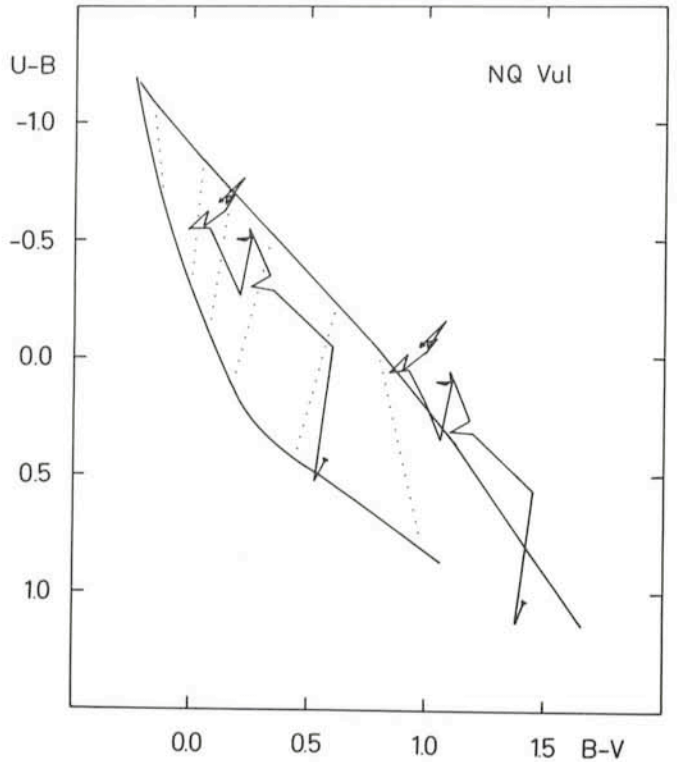


Fig. 2. — The path of NQ Vul in the two-colour diagram (reddened and unreddened). The supergiant and black-body sequences are shown, dotted lines are isothermal lines. In the maxima of the light curve, the nova approaches the supergiant sequence.

and the continuum energy distribution shows still some resemblance with that of supergiant stars, to the late stages, when the spectrum is dominated by emission lines and the photoelectric observations are difficult to interpret. It was found that—in contrast to some earlier views—broad-band photoelectric observations can be very useful. The path of a nova in the two-colour diagram is well suited for classifying the type of nova outburst (fast–medium–slow), it gives an information about the actual stage of the outburst (pre-maximum–maximum–later stages)—especially important when spectroscopic observations are missing—and it even permits to determine the physical characteristics of the outburst (radii, temperatures . . .), the total luminosity, and the amount of matter ejected during the outburst.

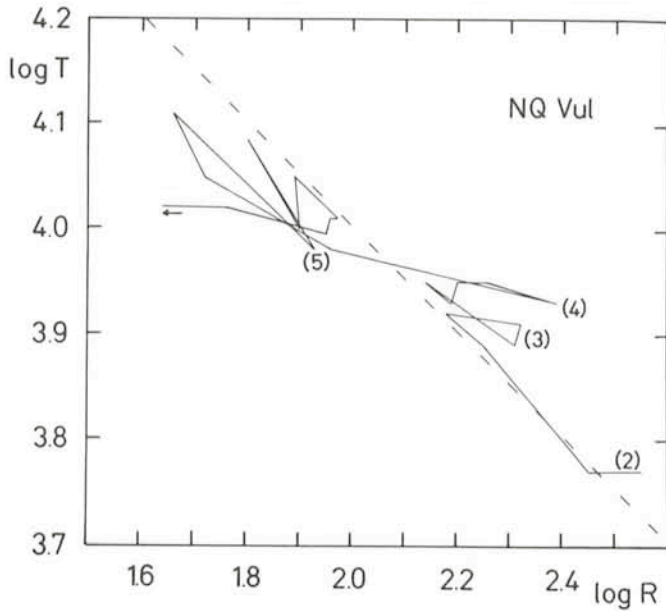


Fig. 3. — $\log T - \log R$ diagram of NQ Vul. The 45° slope corresponds to constant luminosity. The numbers designate various maxima in the light curve of the nova.

As an interesting detail the variation of the radius and the temperature of NQ Vul is shown for different times in the $\log T - \log R$ diagram. Scales are arranged in such a way that a 45° slope corresponds to constant luminosity. For NQ Vul, the luminosity seems to have remained constant within 50 per cent for a time of 30 days, while the visual brightness changed by a factor of 4. Similar results have been derived for nova FH Serpentis through observations in the extreme UV (by satellites) and IR observations, while this result for nova NQ Vul is based on UBV photometry only. Results will be given in a series of forthcoming articles in *Astr. Astrophys.*, by W. Seitter and the writer.

The most fascinating event was, of course, the spectacular appearance of nova (=V 1500) Cygni in late August 1975. An IAU telegram that arrived in the afternoon of August 29 was not communicated to the Visiting Astronomers because of the "inobservability" of the nova from La Silla. It so happened that a V.A., who directed his steps from a dome to the hotel, gazing at the northern constellations with some feeling of homesickness, suddenly ran back to the dome, looking for a star map and saying to his fellow observer: "Either I am crazy, or there is a nova in Cygnus"; and after some minutes, all the domes were alarmed by

phone and turned their contents to this unusual position in the sky over La Silla (except one telescope whose control computer typed "zenith distance!" and refused to cooperate). Dr. Thé (Amsterdam) observed at the Bochum telescope; his VRI observations of nova Cyg were published in IBVS No. 1089. Dr. Wamsteker (ESO) observed the nova at infrared wavelengths with the 1 m telescope (*Astr. Astrophys.*, in press), and Dr. Wolf (ESO/Heidelberg) and the writer obtained a series of coudé spectra with the 1.52 m telescope, which showed clearly the appearance of the diffuse enhanced spectrum, which was of short duration and of extreme weakness in nova Cyg (*Astr. Astrophys. Suppl. Ser.* 29, 297 (1977)). The observations from La Silla were the first ones which gave this evidence. Confirmation from other observers came only after a second inspection of their data.

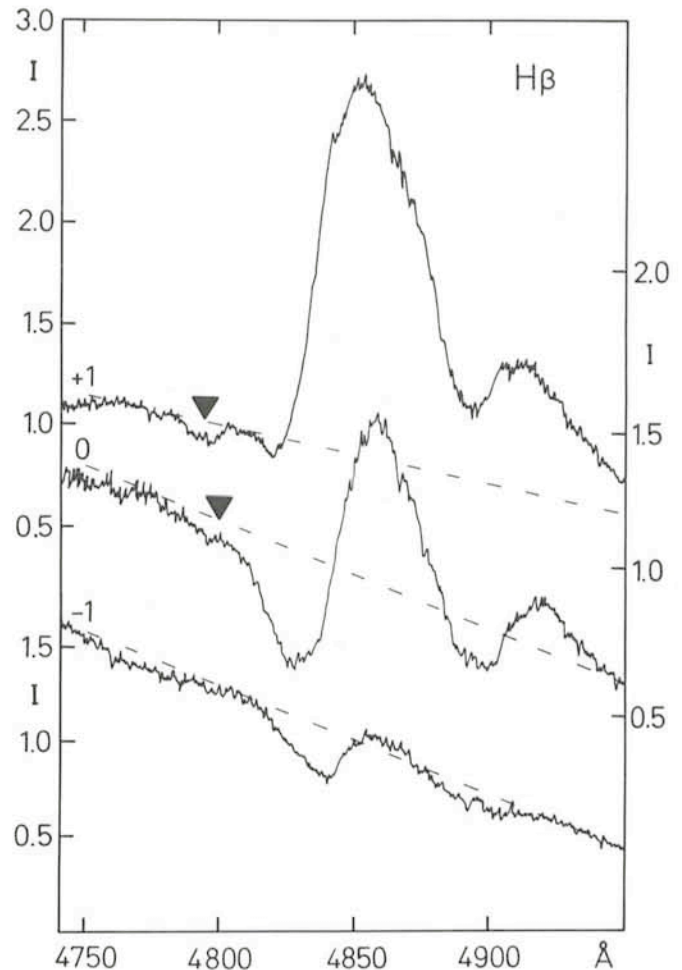


Fig. 4. — The evolution of the $H\beta$ line in nova V 1500 Cyg (1975), derived from ESO 1.52 m coudé spectrograms. At pre-maximum (day -1), the emission is nearly non-existent, while it becomes stronger at maximum (day 0) and post-maximum (day +1). The diffuse enhanced spectrum is marked with arrows.

It might have challenged fate too much to expect a coincidence between a fourth nova and the present writer's next stay at La Silla. Thus he has recently shifted his interests to a more stable phase in the lives of novae. He now awaits allocation of observing time for the study of their nebular remnants.