PHOTOMETRIC PROPERTIES OF V 1329 CYGNI

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Abstract. Light curve and position of V 1329 Cyg in the colour-magnitude diagram are discussed.

The light curves of V 1329 Cyg shown in Figure 1 have been estimated from over 700 photographic and photovisual plates of the Odessa collection covering the years from 1957 to 1973. The data for 1951 and 1954 have been estimated from prints of the Palomar and Lick Atlases respectively.

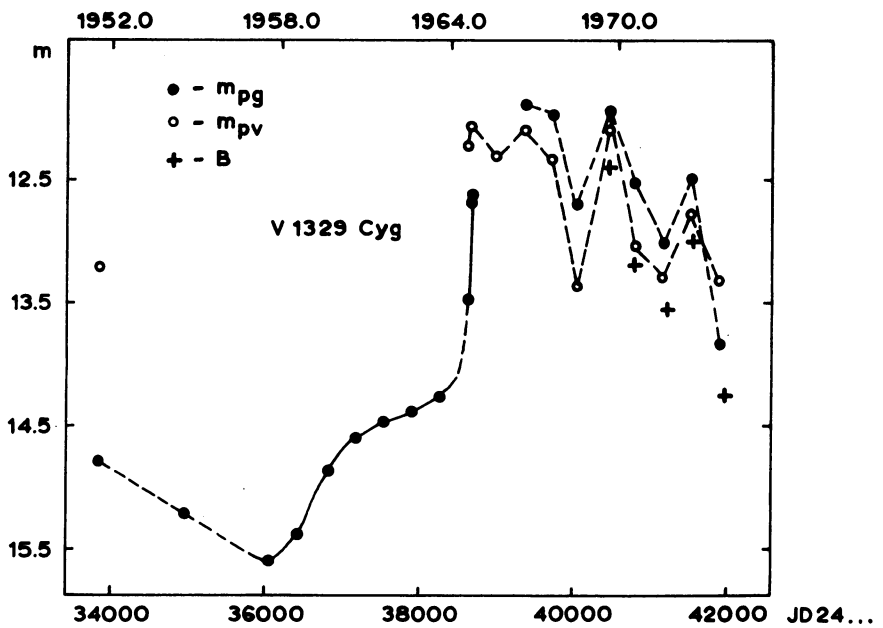

Fig. 1. The light curve of V1329 Cyg.

A drastic increase in brightness, according to our data, occurred in 1964. Before this the star had had a slow light increase from $15^m.6$ in 1957 to $14^m.2$ in 1963. The light rise rate in 1964 was about $0^m.02$ per day. Thus, the V 1329 Cyg flare consisted of two stages, the one of a progressive light increase over seven years, and the other of an abrupt rise in light within several months.

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Of interest is the behaviour of V 1329 Cyg at maximum light. After the fall in light by $0^m.7$ in 1968, the star again brightened and reached a secondary maximum in 1969. It was at that time that it was discovered by Kohoutek as a peculiar emission object. The observed light decrease was replaced by a new rise in light in 1972 and then by a rather significant decrease (to $13^m.8$) in 1973.

V 1329 Cyg having been discovered to be variable, photoelectric observations of the star were started in a system close to that of *UBV* at the Crimean Station of the Sternberg Institute. The observational results in the *B*-range combined with the data by Kohoutek and Bossen (1970) and Bossen (1972) are also shown in Figure 1.

Photographic and photoelectric observations are qualitatively in good agreement with each other. Some quantitative differences arise because of differences in the response curves of the photometric system particularly well pronounced in the case of emission objects. The $B-m_{pg}$ difference is $\sim 0^m.5$ as a result of the bigger pass band width of the instrumental photographic system involving to a certain extent the emission in the Balmer continuum region.

V 1329 Cyg in the two-colour ($U-B$ vs. $B-V$) diagram is located in the region populated by symbiotic stars. With luminosity increase the star is getting blue; however, the displacement paths at light decrease and at its increase do not coincide. This is probably due to progressive variation in the spectrum of V 1329 Cyg in the course of time. Variations in colour index $U-B$ during 1969–1973 depending on luminosity are illustrated in Figure 2, while the star track in the two-colour diagram in the same period is shown in Figure 3.

The combined photometric and spectral data are in favour of classifying V 1329 Cyg as a symbiotic object. The light curves of symbiotic variables are extremely diverse. Some stars in the course of their observational history have suffered several

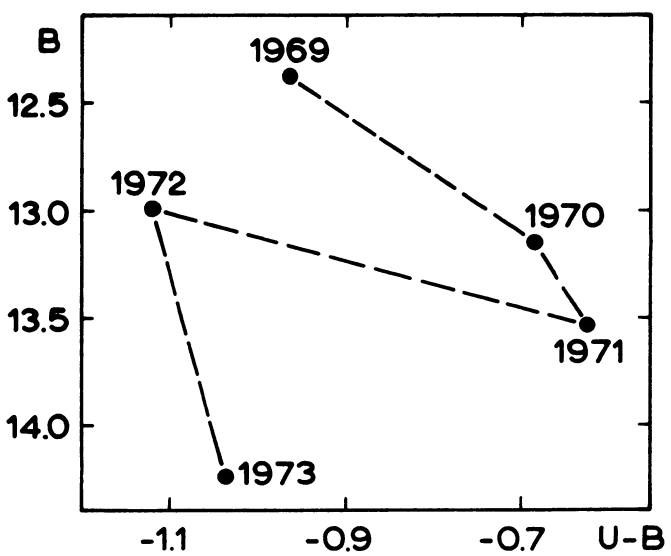

Fig. 2. $U-B$ colour – magnitude diagram for V1329 Cyg.

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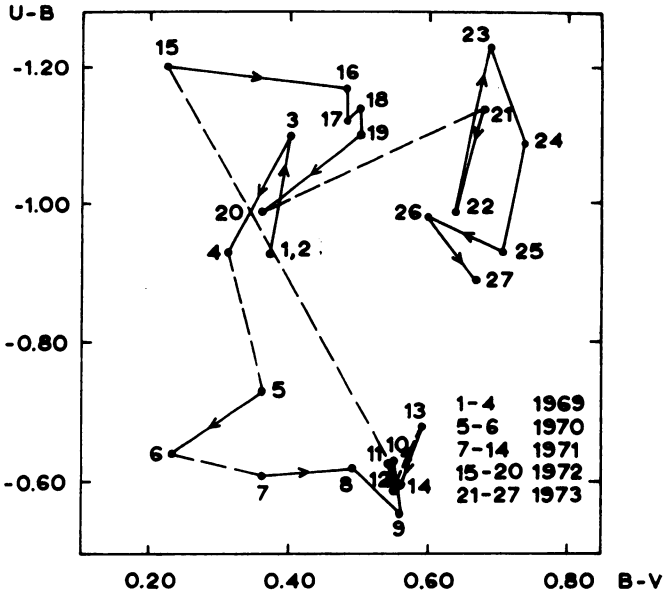

Fig. 3. Two-colour diagram for V1329 Cyg.

considerable flares with amplitudes of 1–3^m, e.g. Z And. Others have had only one large flare (AG Peg). V 1329 Cyg has been observed to flare violently only once ($\sim 3^m.8$).

Symbiotic stars are frequently observed to fluctuate at maximum light (AG Dra, AG Peg). Long period variations with a period of about 580^d and an amplitude of $\sim 1^m$, and irregular fluctuations on a shorter time scale are characteristic of V 1329 Cyg.

Spectral variations in symbiotic stars during flares are also individual but there are general conformities, too:

(1) With light decrease, colour index $B-V$ increases and $U-B$ decreases. The first condition holds true for V 1329 Cyg. The $U-B$ variations are more complicated ones.

(2) An M-type absorption spectrum is observed at minimum light. TiO bands usually disappear during flares. Before the flare, V 1329 Cyg had an M spectrum and was very red according to photometric data. Our estimations from prints of the *Palomar Atlas* yield (1951) $B=14^m.8$ and $V=13^m.2$, so that $B-V=+1^m.6$.

(3) During flares, the spectrum of an A-type envelope developes. V 1329 Cyg has been observed to have numerous lines of once ionized metals.

(4) At light decrease there appear emission lines of higher and higher excitation, including forbidden ones. The [O III] lines in V 1329 Cyg appeared after light maximum.

Thus, V 1329 Cyg according to its photometric and spectral properties can be classed with the symbiotic stars.

References

Bossen, H.: 1972, *Inf. Bull. Var. Stars*, No. 722.
Kohoutek, L. and Bossen, H.: 1970, *Astrophys. Letters* **6**, 157.

DISCUSSION

J. Grygar: F. M. Stienon, M. R. Chartrand, and C. G. Shao (*Astron. J.* **79** (1974), 47) suggested recently that V 1329 Cygni is actually an eclipsing binary with a rather long period of 960 days. Could you verify this proposal in your observations?

O. E. Mandel: No, the quoted period is spurious.

A. Mammano: The molecular bands never disappeared in HBV 475 = V 1329 Cyg; another distinction from what is said in the literature for symbiotic stars is that, in the case of HBV 475 = V 1329 Cyg, nebular lines are also seen at maxima. This is also the case for V 1016 Cyg, where nebular lines where found even along the rising branch.

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