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THE IUE ULTRAVIOLET SPECTRUM OF V1073 CYGNI

V1073 Cyg (HD204038, BD+33^{o}4252) is a contact binary with an Am-type star as the bright member although Hill, et al. (1975) give an early F-classification, perhaps as a result of the dispersion of their spectra. FitzGerald (1964) has solved the double line velocity variation using several measurements of the weak, diffuse lines of the secondary star. Popper (1970), however, noted that the visible-band lines for each component are of a quality too poor to yield reliable masses. Kondo (1966) and Bendenelli, et al. (1967) analyzed the partially-eclipsing light curve and Kruseman (1968) noted that his light curves agree with Kondo's solution. A newer synthesis of Kondo's light curve has been presented by Leung and Schneider (1977), who then also represented FitzGerald's velocities on the basis of a circular orbit. It is possible to compare the Strömgren indices by Hilditch and Hill (1975) to the calibration by Crawford and Mandwewala (1976). The metallicity of V1073 Cyg is evident from this comparison but it is also clear that the reddening cannot be derived from the heavily blanketed ($\underline{u}$-$\underline{b}$) and c_1 parameters. An upper limit to E($\underline{b}$-$\underline{y}$) is of the order of 0.06 leading to an upper limit, E($\underline{B}$-$\underline{V}$) = 0.08.

Because the period is short, numerous timings of minimum light have been observed and largely collated by Strohmeier, et al. (1962), Kondo, and Strohmeier and Bauernfeind (1968). A few additional timings have become available in the last decade. These eighty years of history make it clear that the eclipses occur at half-period intervals and that

the period has varied, but the scatter and character of the residuals from a constant-period ephemeris can be explained either by a secular change at a variable rate or by one discontinuous period increase about JD2427600. For purposes of this note, phases have been calculated from: Hel. Pr. Min. = 2438672.5826 + 0.7858592E.

Program PG2SS, originally defined by S. Sobieski, permitted observation of V1073 Cyg with the IUE satellite. The description of the instrumentation package is given at length in the October 5, 1978 issue of Nature. The journal of our three observations taken in the low-dispersion mode appears in Table I which lists in successive columns

Table I
Low Dispersion Spectra of V1073 Cyg

Image	Hel.J.D.	Phase	Exposure	Aperture	Remarks
LWR2047	2443732.031	0.098	23 min.	Large	Saturated from λ2495 to λ3035
LWR2047	2443732.051	0.136	19	Small	Underexposed shortward of λ2400
LWR2058	2443733.059	0.419	14	Large	

the image number, the mean heliocentric Julian Day Number and phase of the observation, the exposure length and the choice of the large (10" x 20" ellipse) or small (3" circle) aperture for the spectrograph.

Neither interstellar absorption nor stellar emission lines were detected. Each spectrum shows absorption features which are very broad, in part because of the low resolution (≃ 6Å) of the spectra and in part because of the very large number of unresolved, low excitation lines. Because of the unresolved richness of the spectrum, we content ourselves with describing the evidence for 8 common atoms and ions.

Fe I: The strongest evidence is a possible contribution from multiplet 1 to an absorption feature at λ2970. Possibly present.

Fe II: Almost every strong transition falls within a conspicuous absorption feature. The only discrepancy occurs near λ2240

where several intense lines should fall, but only a weak absorption is seen. Definitely present.

Cr II: Blends of lines from multiplets 5, 6, and 11 fall within absorptions of moderate strength near λλ2860, 2750, and 2870, respectively. Definitely present.

Mg I: The strongest line is expected to occur at λ2852 and a weak absorption is seen at about that wavelength. Possibly present.

Mg II: The resonance doublet at λλ2795, 2802 is conspicuously in absorption. Members of multiplet 2 fall within a moderate absorption feature near λ2930. Definitely present.

Mn II: Three strong lines of multiplet 1 fall within a conspicuous absorption near λ2600. Possibly present.

Ti I: The strongest transitions of multiplet 1 fall near an absorption feature at λ2950. It is possible that multiplet 3 contributes to an absorption feature at λ2645. Possibly present.

Si I: Multiplet 1 may contribute to a strong absorption feature near λ2525. Possibly present.

A smooth free-hand continuum was drawn from LWR2058, corrected for the cathode sensitivity by the calibration in IUE Newsletter No. 2, and dereddened for E(B-V) = 0.08 by the interstellar extinction curve due to Jamar, et al. (1976). This was compared to sample model atmospheres in the range from 8750K through 6000K - thus bracketing the spectral classifications - drawn from the compilation by Carbon and Gingerich (1969). It proved impossible to reproduce the spectral gradient of the observations by any of these atmospheres, a circumstance due, no doubt, to the severe blanketing.

Obviously, better spectra would be desirable. With the IUE, a suitable high resolution exposure with the small aperture would, however, be longer than the binary period.

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References:

Bendenelli, O., Delli Ponti, C., Catalano, S., and Cristaldi, S. 1967, Mem. Soc. Astr. Ital. 38, 763.

Carbon, D.F., and Gingerich, O. 1969 in Proc. Third Harvard-Smithsonian Conference on Stellar Atmospheres, O. Gingerich, ed (Cambridge: M.I.T. Press), p. 377.

Crawford, D.L., and Mandwewala, R. 1976, Pub. A. S. P. 88, 917.

FitzGerald, P. 1964, Pub. D. D. O. 2, 417.

Hilditch, R.W., and Hill, G. 1975, Mem. R. A. S. 79, 101.

Hill, G., Hilditch, R.W., Younger, F., and Fisher, W.A. 1975, Mem. R. A. S. 79, 131.

Jamar, C., Macau-Hercot, D., Monfils, A., Thompson, G.I. Houziaux, L., and Wilson, R. 1976, Ultraviolet Bright Star Spectrophotometric Catalogue.

Kondo, Y. 1966, A. J. 71, 54.

Kruseman, P. 1968, B. A. N. Supp. 2, 377.

Leung, K.C., and Schneider, J.J. 1978, Ap. J. 222, 917.

Popper, D.M. 1970, Bull. A. A. S. 2, 12.

Strohmeier, W. and Bauernfeind, H. 1968, Veröff. Remeis Sternw. Bamberg 7 (72).

Strohmeier, W., Knigge, R. and Ott, H. 1962, Veröff. Remeis Sternw. Bamberg 5 (13).