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HD 72754 - A NEW Be VARIABLE STAR OF BETA LYRAE TYPE

The star HD 72754 (Bp; $8^h29^m.4$, $-49°16'$, 1900, with note "The line Hβ is bright. The helium lines are faint") was found on Radcliffe slit spectra to have a remarkable early B type shell + stellar spectrum with variable velocity. A request for photometry was addressed to the Royal Observatory, Cape, and observations were secured over three successive seasons concurrently with Radcliffe spectroscopy.

The Cape observations (in U,B,V, with the 1.02m Elizabeth reflector) are listed in Table I, the first 11 by one of us (P.W.H.) which showed the star to be variable with small amplitude; the remainder were made by many observers on the Cape staff including J.B.A. who also organised the reductions.

The observations are plotted (V, B-V, U-B) in fig.1 against phase using the reciprocal period

$$p^{-1} = .029648 \text{ days}^{-1} \text{ or } P = 33.72 \text{ days.}$$

This period was determined from a least-squares solution for the radial velocity measures (by A.D.T.). The photometry had first suggested a period of order 17 days but the spectroscopy clearly demonstrated that there must be two minima in a period twice as great.

The numerous photometric observations now available confirm the difference between the two minima based on the longer period. The deeper of the minima in V occurs at about phase .16 when the spectra show that the visible star is in superior conjunction. Although the B-V colour remains remarkably constant through the cycle, U-B does not and has a greater variation during the secondary minimum of V (inferior conjunction).

The spectroscopic orbit will be published elsewhere. The spectra have not demonstrated the nature of the secondary star but a massive system is indicated and the complex phenomena are strikingly reminiscent of β Lyr and W Crucis. It is possible that the variations in V are entirely ellipsoidal in character; but the behaviour of U-B can be qualitatively understood if the U magnitude is dominated by H recombination beyond the Balmer limit in a gaseous stream which is partly obscured during both minima and more so with the bright star in front.

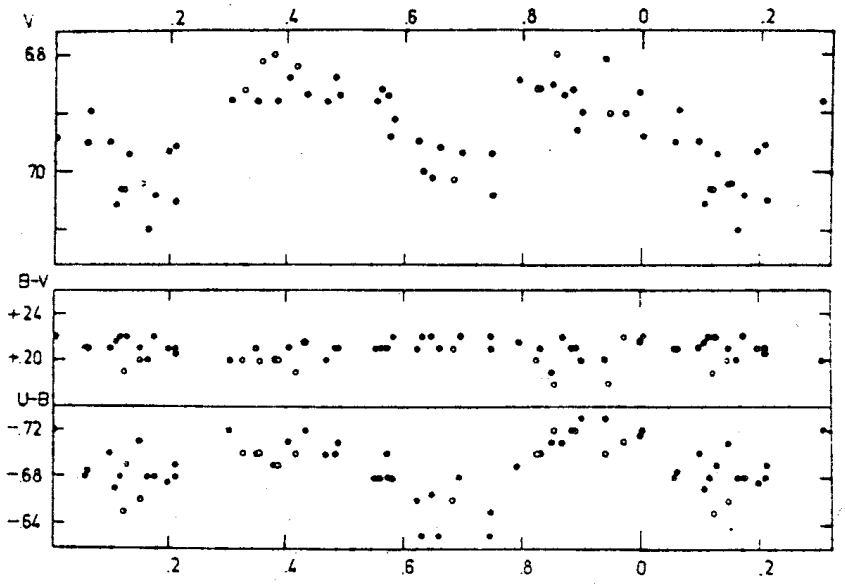

Fig. 1
Light and Colour-curve of HD 72754 (V, B-V, U-B).
Phases are computed from .029648 (JD - 2,400,000).
First season's observations shown with open circles.

The observed variations can be summarised as follows:

V = 6.84 to 7.06 (1), 6.99 (2)
B - V = +0.19
U - B = -0.73 to -0.67: (1), -0.65: (2).

The scatter about the mean curves must be mainly intrinsic in character, as is often found in massive close binaries.

It will be of interest to look for systematic variation in period such as has been found in βLyr as perhaps the most significant instance of rapid stellar evolution during a few decades.

Our thanks are due to Dr R.H. Stoy and Mr G.Harding for access to the Royal Observatory equipment for these observations during the three relevant seasons, and to the Cape staff for much assistance in making the observations. One of us (P.W.H.) is indebted to the Science Research Council for a travel grant.

Observations of HD 72754.

Heliocentric J.D.	V	B-V	U-B	Phase
243 9929.323	6.86	+0.20	−0.70	.825
9930.365	6.80	+0.22	−0.72	.855
9933.408	6.90:	+0.22	−0.70	.946
9934.285	6.90	+0.18	−0.71	.972
9939.346	7.03	+0.21	−0.65	.122
9940.342	7.02	+0.20	−0.66	.151
9946.280	6.86	+0.20	−0.70	.327
9947.305	6.81	+0.20	−0.70	.357
9948.281	6.80	+0.20	−0.69	.387
9949.299	6.82	+0.21	−0.70	.417
9958.264	7.01	+0.19	−0.66	.683
244 0181.585	6.88	+0.20	−0.72	.304
0187.587	6.84	+0.19	−0.70	.482
0190.574	6.87	+0.19	−0.70	.570
0196.567	7.04	+0.19	−0.63	.748
0200.588	6.87	+0.18	−0.71	.867
0210.586	7.10	+0.20	−0.68	.163
0221.525	6.87	+0.19	−0.71	.488
0224.425	6.94	+0.19	−0.68	.574
0228.516	6.97	+0.18	−0.68	.695
0235.426	6.90	+0.20	−0.73	.900
0252.432	6.84	+0.19	−0.71	.404
0257.430	6.88	+0.19	−0.68	.552
0258.435	6.91	+0.18	−0.68	.582
0267.451	6.85	+0.21	−0.71	.849
0270.481	6.81	+0.20	−0.73	.939
0274.419	6.95	+0.19	−0.68	.056
0278.403	7.04	+0.18	−0.68	.174
0284.339	6.88	+0.19	−0.70	.350
0285.371	6.88	+0.20	−0.69	.381
0288.321	6.88	+0.20	−0.70	.468
0291.417	6.86:	+0.19	−0.68	.560
0302.330	6.86	+0.19	−0.72	.883
0306.313	6.94	+0.18	−0.72	.002
0311.300	7.02	+0.19	−0.71	.149
0312.342	7.05	+0.19	−0.69	.180
0336.286	6.93	+0.19	−0.72	.890
0343.246	6.95	+0.19	−0.70	.097
0344.273	6.97	+0.18	−0.69	.127
0361.248	7.00	+0.18	−0.63	.630
0362.233	6.96	+0.19	−0.63	.659
0365.218	6.97	+0.18	−0.65	.748
0613.424	7.05	+0.18	−0.67	.107
0616.502	6.96	+0.19	−0.67	.198

Heliocentric J.D.	V	B-V	U-B	Phase
244 0624.425	$6^{m}_{.}87$	$+0^{m}_{.}18$	$-0^{m}_{.}72$	.433
0643.451	6.86	+0.18	-0.71	.997
0647.426	7.03	+0.18	-0.68	.115
0665.345	7.01	+0.18	-0.66	.646
0670.326	6.84	+0.18	-0.69	.794
0679.349	6.89	+0.19	-0.68	.061
0684.366	6.95	+0.19	-0.68	.210
0698.243	6.95	+0.19	-0.66	.622
0705.269	6.86	+0.19	-0.70	.830

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