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VARIABLE STAR IN THE GALACTIC CLUSTER NGC 7654

During the course of photographic photometry in the vicinity of the galactic cluster NGC 7654 = M 52 one of the standard stars was detected to be variable. It is NGC 7654-26 in the list of Hoag et al. (1961). The photographic plates (UBV system) were taken in the years of 1971 to 1980 with the 60/90-cm Schmidt telescope of Jena University Observatory (Großschwabhausen outstation). Results of iris-photometry of all the plates are collected in Table I and extracts drawn in Fig. 1. In the Figure the arrows at the ordinate scale indicate the magnitudes published by Hoag et al. (1961). The variation in brightness amounts to at least 0.5 mag in the B and V colours, it remains uncertain in U. The

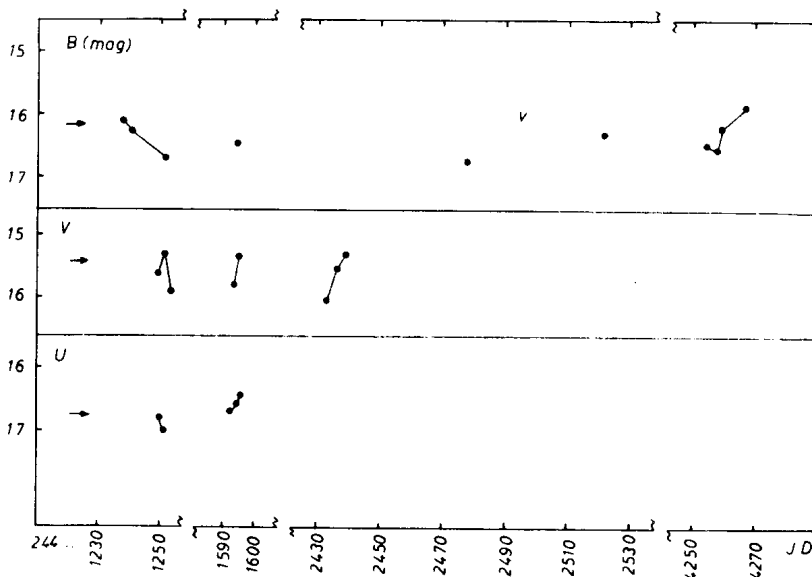


Figure 1

light changes observed are inconclusive as to the type of variability. The ranges of types under consideration is restricted, however, by the spectral type (early A-type) of the star. Further photometric observations are desirable.

Table I

Photographic observations of NGC 7654-26

(Results of photoelectric observations by Hoag et al. (1961):

V = 15.44 mag. (B - V) = 0.72 mag. (U - B) = 0.60 mag.)

J.D. 244...	B (mag)	J.D. 244...	V (mag)	J.D. 244...	U (mag)
1237.49	16.11	1249.39	15.61	1249.45	16.79
1240.58	16.25	1251.36	15.29	1251.44	17.00
1251.48	16.70	1253.39	15.89	1592.45	16.68
1594.40	16.44	1276.34	>15.5	1594.37	16.58
1594.41	16.53	1593.40	15.81	1595.46	16.47
2477.36	16.70	1593.47	15.79	1982.40	16.65:
2494.37	>16.0	1595.40	15.34	1989.36	16.50
2521.60	16.32	2433.34	16.02		
3075.40	16.52	2436.35	15.51		
3157.36	16.62	2439.31	15.29		
3336.51	16.38	2652.51	15.72		
3745.43	16.44	2654.58	15.45		
3745.59	16.45	2765.42	15.16		
4254.39	16.47	3075.43	15.76		
4257.31	16.56	3336.49	16.00		
4259.31	16.19	3336.56	15.65		
4266.30	15.89				

From the colour indices given at the head of Table I a reddening  $E(B-V) = 0.7$  mag and spectral type A2 follow. If we assume A2V ( $M_V = 1.6$  mag) then the star is at a distance of 2.3 kpc. This is in accordance with  $r = 2.1$  kpc and  $E(B-V) = 0.51 \dots 0.81$  mag as quoted by Schmidt (1962) for the cluster. Upon photometric quantities Mermilliod (1976) also classifies the star as a cluster member. For the importance of this statement an independent proof of cluster membership was attempted.

From the luminosity function and the total number of cluster stars both given by Taff (1974) the number of cluster members within an 1-mag interval about  $M_B = 1.6$  mag can be derived as  $N_{Cl}(M_B = 1.6) = 68$ . For the field stars application of the Schwarzschild integral equation of the space density law gives  $N_f(B=16) = 20$  as the number of stars per magnitude within the 18 min of arc diameter cluster area. The star densities used in the

computations are from Allen (1973), interstellar extinction was taken into account, and the cluster diameter is from Wallenquist (1933). If the areal densities of stars derived this way are adjusted to the star counts made by Wallenquist (1933) at brighter magnitudes the higher and probably more reliable number  $N_f(B=16) = 44$  results. So the probability that a certain star at  $B = 16$  mag is a cluster member turns out to be between 0.61 and 0.77 with the lower value being of higher weight. From this statement together with the photometric result and the position of the star 5.2 min of arc from the cluster centre it seems to be quite sure that NGC 7654-26 is really a cluster member.

I am indebted to Mr. D. Uhlig, former member of the technical staff of our observatory. He directed my attention to the star and made the first photometric measurements.

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