COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 3111

Konkoly Observatory
Budapest
11 November 1987

HU ISSN 0374-0676

THE NATURE OF THE VARIABILITY OF 42 Per

The star 42 Persei (HD 23848, V467 Per) is listed in the latest edition of the General Catalogue of Variable Stars (Kholopov et al. 1987) as an eclipsing variable with a period of $22\overset{d}{.}58$ - a period derived by Kolykhalova et al. (1978) from photoelectric observations. The total range in V is less than $0\overset{m}{.}1$. W.S. Adams (1912) first identified the star as a spectroscopic binary, on the basis of four radial velocity observations.

Observations were made at several other observatories, especially Allegheny (Beardsley 1969) but the only orbital elements to have been determined were computed by Morbey and Brosterhus (1974). These elements depend strongly on the Allegheny observations. While it might be possible to improve the elements if modern observations were to be made from a single observatory, it seems unlikely to the present writer that the period of $1\overset{d}{.}765346$ is seriously in error.

Although the light-curve published by Kolykhalova et al. does resemble that of a system displaying very shallow eclipses, the period is not reconcilable with that found spectroscopically.The photometric period is not a simple multiple of the spectroscopic one, nor is it one of the spurious periods associated with the $1\overset{d}{.}8$ period (although it is about ten times as long as one of the spurious periods). The distribution of the photometric observations is not favourable for the detection of a period as short as $1\overset{d}{.}8$. In Figure 1, those observations are plotted on the $1\overset{d}{.}8$ period (the zero of phase is the time of periastron passage as given by Morbey and Brosterhus). Except for those labelled 1,2 and 3, the observations define a double wave within the orbital period. The minima of the wave occur close to the predicted phases of spectroscopic conjunctions ($0\overset{P}{.}02$ and $0\overset{P}{.}53$) which are probably well determined despite the uncertainties in e and ω. Of the three deviant points, No. 1 is marked as uncertain by Kolykhalova et al. and No. 2 is some $0\overset{m}{.}02$ brighter than any other measurement. In the light-curve published by Kholykalova et al. point No. 2 is still deviant, occuring near the phase of secondary minimum; in the present plot, at least it is found close to the phase of maximum brightness. Thus, only the point No. 3 is deviant without any a priori reason to reject it. If it should be in error

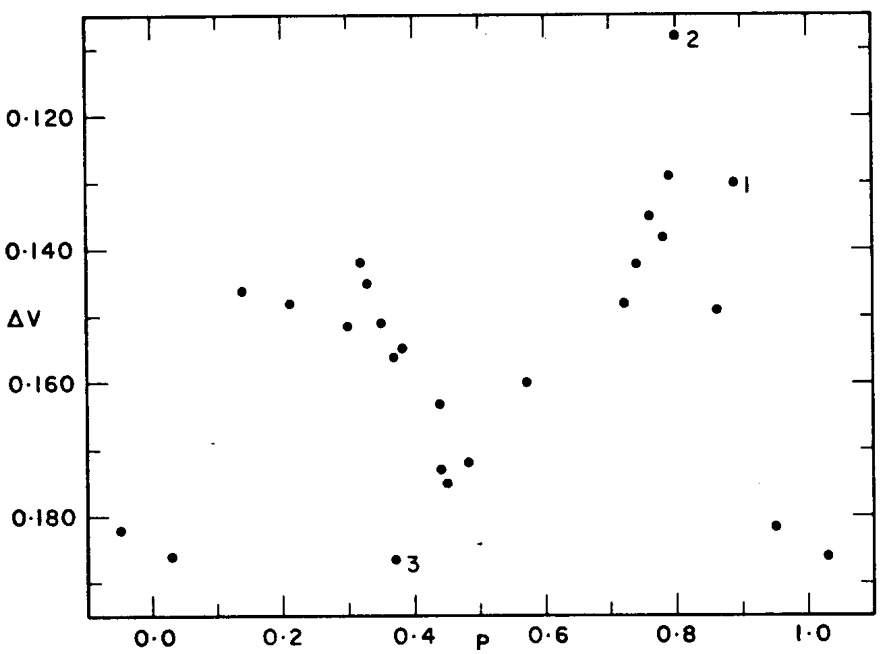

Figure 1: Photometric observations of 42 Per plotted on the spectroscopic period. See text for details.

by as much as the other two (but in the opposite sense) it would fit the curve quite well. On the other hand the Allegheny observations of radial velocity make no sense on the period of $22^{d}.58$.

The minima of the light-curve are poorly defined by the available observations and very shallow eclipses still cannot be ruled out from the shape of the light-curve alone. The very small mass-function ($0.0074m_{\odot}$) makes eclipses seem unlikely, however. If the visible A3 V star is plausibly assumed to have a mass of about 2 $m_{\odot}$, no credible value for the mass of the invisible component can be deduced for any value of the orbital inclination that produces eclipses. For an inclination of around 25^{o}, it would be possible to satisfy the mass-function with individual masses of about 2 $m_{\odot}$ and 1 $m_{\odot}$, and the system would then consist of stars on or near the main sequence. These figures have been deliberately kept approximate but they serve to indicate that 42 Per should probably be classified as an ellipsoidal variable. The star may repay further observation.

A.H. BATTEN

Dominion Astrophysical Observatory
Herzberg Institute of Astrophysics
5071 W. Saanich Road
Victoria, B.C. V8X 4M6
CANADA

References:

Adams, W.S.: 1912, Pub. Astr. Soc. Pacific 24, 129.

Beardsley,W.R.: 1969, Pub. Allegheny Obs. 8, No. 7.

Kholopov, P.N. et al.: 1987, General Catalogue of Variable Stars, 4 th Ed. Vol. 3. Nauka, Moscow.

Kolykhalova, O.M., Mironov, A.V. and Moshkalev, V.G.: 1978, Per.Zvezd 21, 105.

Morbey, C.L. and Brosterhus, E.B.: 1974, Pub. Astr. Soc. Pacific 86, 455.