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ON THE X-RAY STAR WW Ari = EXO 020528+1454.8

WW Ari, consisting of a pair of dMe stars (dM4.5e+dM4.5e), is identical with Lowell's proper motion star G035-027. First results about the behaviour of the total light of the system in the optical range were given by Hudec et al. (1988) and Götz (1987).

To complete and supplement the study of the optical behaviour, the star was measured on 101 blue-sensitive plates (ORWO ZU21+ GG13+BG12) from 54 nights obtained with the Schmidt camera 50/70/172 cm of Sonneberg Observatory, covering the time interval between October 2 1987 and February 2 1991. The observations are linked to the sequence of comparison stars given by Götz (1987). The light curve in B is given in Figure 1; it shows the individual observations and, in addition, the series of the season 1986/87. It turns out that the two series differ. While in the season 1986/87 most of the observations are brighter than $m_B = 16^m.0$, in the season 1987-91 a remarkable number of observations are fainter than $m_B = 16^m.0$. The star is scattering nearly over the whole range of amplitude and the light curve is characterized by short-term flares and depressions starting from a mean level. This fact is also confirmed by the histogram given in Figure 2, where the brightness distributions of observations published by Hudec et al. (1988) and Götz (1987) (clear areas) and those of the new series are shown. Remarkable brightness changes of the star are listed in Table I. Considering all observations of the star, the total amplitude of the system in B amounts to 1.2 mag ($15^m.3$ - $16^m.5$).

On 3 plates of the new series the two components of the system are isolated and separate. The individual magnitudes of the eastern and western components of WW Ari are given in Table II, where

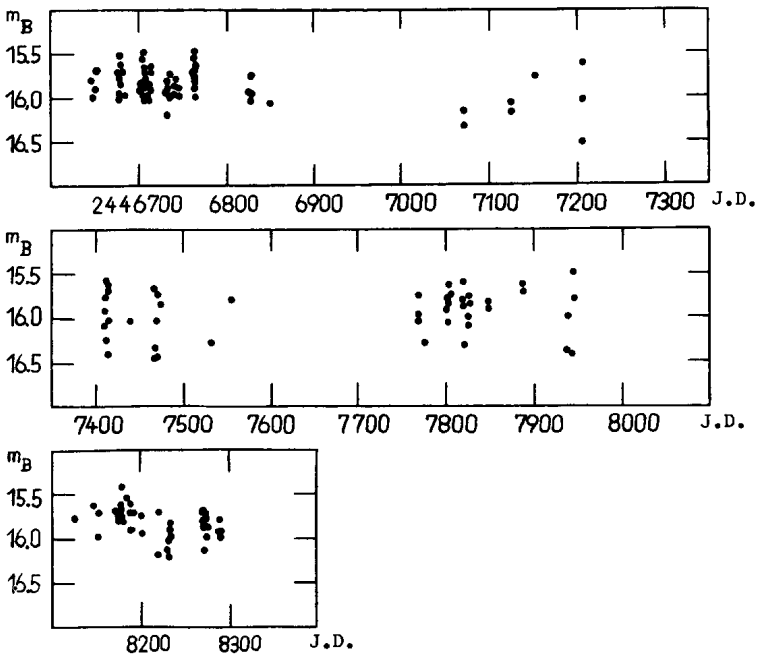

Figure 1

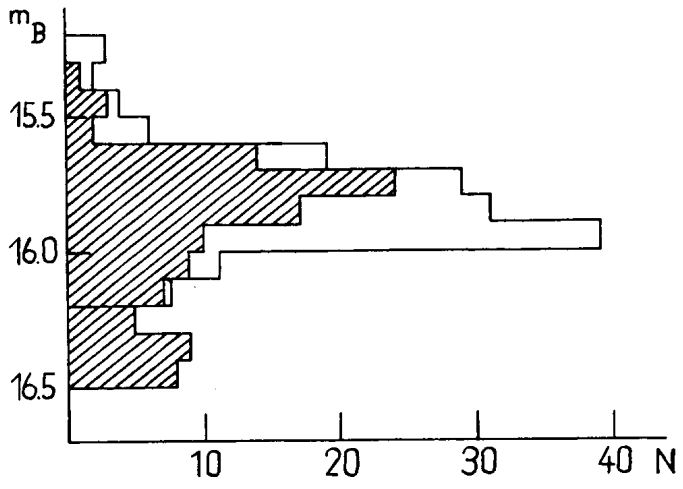

Figure 2

Table I

J.D.hel 244....	m_B	Δt	Δm_B	J.D.hel 244....	m_B	Δt	Δm_B
7205.261	$15^m.62$	$0^d.015$	$+0^m.88$	7823.447	$15^m.86$	$0^d.017$	$+0^m.46$
276	16.50			464	16.32		
7413.537	15.75	0.021	+0.51	8220.462	16.18	0.017	-0.49
558	16.26			479	15.69		
7414.521	16.41	0.020	-0.83	8274.238	15.80	0.038	-0.43
541	15.58			276	15.38	0.019	+0.45
7471.348	16.47	0.016	-0.71	295	15.82		
364	15.76						

Table II

J.D.hel 244....	m_B eastern component	m_B western component	distance
7415.548	$16^m.43$	$16^m.40$	3".32
8274.238	15.99:	16.02:	2.93
8274.276	15.76:	15.87:	3.16

the measured angular distances of the two stars have also been listed. In this connection it should be mentioned that the brightness and distance measurements were difficult. As can be seen from Table II, both objects are variable nearly of the same order and in the same manner.

On the best plate, from J.D.hel 244 7415.548, the two dM4.5e stars show nearly the same brightness of $m_B = 16^m.4$. Considering an absolute magnitude of $M_V = 11.8$ and a colour index of (B-V) = 1.59 according to data given by Schmidt-Kaler (1982), one finds that the distance to the earth is D = 40 pc. This value is at the upper margin of that given by Hudec et al. (1988) with D = 25 pc $\pm$ 15 pc, who worked with an average absolute magnitude of $M_V = 13.2$ for dM4-5 stars of the solar neighbourhood. Considering the mean brightness of the stars on the other plates, one obtains distances of D = 33 pc and D = 30.5 pc.

From the largest and the smallest distances to the earth on the basis of the angular distances the distances between the two stars can be determined. These results are given in Table III, where the values of the individual observations and the mean dis-

tances averaged over all observations are shown. There is no doubt that the system WW Ari is a close pair of stars between which interaction by means of X-rays is possible.

Table III

Angular distance	distances between both components in Astronomical Units	
	D = 25 pc	D = 40 pc
3".32	83.0	132.8
2.93	73.3	117.2
3.16	79.0	126.2
3.14	78.5	125.6

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References:

Hudec,R.et al., 1988, BAC 39,296-302

Götz,W., 1987, Inf.Bull.Var.Stars No. 3045

Schmidt-Kaler,Th., 1982, Landolt-Börnstein, Group VI Vol.2b, 15-18, Springer-Verlag Berlin, Heidelberg, New York