COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 4639

Konkoly Observatory
Budapest
12 October 1998

HU ISSN 0374 – 0676

TWO LONG-NEGLECTED INTERESTING ECLIPSING BINARIES

NIKOLAI SAMUS[1], FELICIA TAM[2]

[1] Institute of Astronomy, Russian Academy of Sciences, 48, Pyatnitskaya Str., Moscow 109017, Russia; visiting astronomer, Maria Mitchell Observatory, Nantucket, MA 02554, USA [samus@sai.msu.su]

[2] Department of Physics, Stanford University, Stanford, CA 94305, USA and Maria Mitchell Observatory, Nantucket, MA 02554, USA [ftam@leland.stanford.edu]

In the course of studying variable stars lacking finding charts or having other identification problems, we have studied two rather interesting eclipsing binaries, VX Sct and V936 Aql.

VX Sct was discovered by Cannon (1924). Oosterhoff (1943) found that it was an Algol star varying between $13\overset{m}{.}6$ and $14\overset{m}{.}2$ (photographic magnitudes) and having the following light elements:

$$\mathrm{Min} = \mathrm{JD}2427926.8 + 33\overset{d}{.}623 \times E. \qquad (1)$$

To our knowledge, no finding chart is available in the literature. Despite that, Szafraniec (1963) published a number of visual observations obtained by several observers and Kreiner (1976) published one uncertain date of minimum.

Using plates of the Maria Mitchell Observatory archive, we have rediscovered and studied the star. It is identical to GSC 5699.5176 ($18^h33^m59\overset{s}{.}64$, $-11°54'57\overset{''}{.}5$, 2000.0). Improved light elements have been determined:

$$\mathrm{Min} = \mathrm{JD}2447359.4 + 33\overset{d}{.}6208 \times E. \qquad (2)$$

Table 1 presents the list of minima from the literature and of definite fadings from our observations, with $(O-C)$ values from the elements (2).

The system is interesting because it probably has giant components and deserves further study.

V936 Aql was discovered by Harwood (1962) and never observed since. Harwood announced the star to be a short-period eclipser varying between $13\overset{m}{.}9$ and $14\overset{m}{.}8$ (photographic magnitudes). In the position shown by Harwood's finding chart, two stars are present in the US Naval Observatory A1.0 catalog: $19^h0^m17\overset{s}{.}48$, $-5°37'50\overset{''}{.}0$ ($m_{blue} = 14\overset{m}{.}5$, $m_{red} = 12\overset{m}{.}6$) and $19^h0^m17\overset{s}{.}16$, $-5°37'57\overset{''}{.}1$ ($m_{blue} = 14\overset{m}{.}4$, $m_{red} = 11\overset{m}{.}7$). The first of the two stars is identical to GSC 5140.2463 ($19^h0^m17\overset{s}{.}48$, $-5°37'49\overset{''}{.}0$, 2000.0).

We estimated V936 Aql on 1167 plates of the MMO collection (7.5-inch Cooke refractor at Nantucket) and on 249 plates of the Moscow archive (40-cm astrograph, first in Kuchino near Moscow, then at the Crimean Laboratory of the Sternberg Astronomical Institute). The plates span the JD interval from 2421871 to 2448397. The photographs show that it is the north-western (GSC) star that really varies. The red companion is almost always considerably fainter than the variable. On MMO plates, the images of the two stars merge

Table 1: Minima of VX Sct

JD 24...	$O-C$	Source	JD 24...	$O-C$	Source
23588.6	–0^d.9	Oosterhoff	33507.7	+0^d.1	Present paper
23993.6	+0.7	Oosterhoff	33541.6	+0.3	Present paper
25305.65:	+1.5:	Kreiner	33910.5	–0.6	Present paper
27926.9	+0.3	Oosterhoff	34213.7	0.0	Present paper
27960.9	+0.7	Oosterhoff	34650.5	–0.2	Present paper
29104.4	+1.1	Oosterhoff	34651.5	+0.8	Present paper
29136.4	–0.5	Oosterhoff	39761.6	+0.5	Present paper
29439.5	0.0	Oosterhoff	44434.8	+0.4	Present paper
32464.5	–0.9	Present paper	45611.5	+0.4	Present paper
32800.6	–1.0	Present paper	46619.7	0.0	Present paper
32801.6	0.0	Present paper	47358.7	–0.7	Present paper
33506.7	–0.9	Present paper	47393.7	+0.7	Present paper

Table 2: Minima of V936 Aql

JDhel 24...	$O-C$	Source	JDhel 24...	$O-C$	Source
24382.396	+0^d.008	MMO	34602.824	+0^d.008	MMO
25407.697	–0.012	MMO	35753.885	–0.004	MMO
26217.667:	+0.012:	MMO	38964.265	0.000	Moscow
26513.490	–0.004	MMO	40065.221	–0.005	Moscow
26942.745:	–0.054:	MMO	40808.196	+0.002	Moscow
27284.409	–0.003	MMO	41188.348	–0.002	Moscow
27669.396	+0.007	MMO	41219.667	–0.002	MMO
27988.831	–0.006	MMO	41521.285	–0.003	Moscow
28370.436	–0.005	MMO	42547.565	–0.001	Moscow
28716.872	0.000	MMO	42978.788:	–0.007:	MMO
29051.779:	+0.039:	MMO	43746.826:	+0.009:	MMO
29468.527	+0.011	MMO	44102.390	–0.010	MMO
29845.788	+0.004	MMO	44460.869	–0.006	MMO
32433.659:	+0.006:	MMO	44816.463	+0.006	MMO
32762.737	-0.001	MMO	45519.428	–0.005	MMO
33121.706	+0.011	MMO	46319.738	+0.002	MMO
33481.619	+0.003	MMO	47802.778	+0.002	MMO
33853.578	–0.005	MMO	48090.430	+0.007	Moscow

on many plates, thus making estimates difficult. On Moscow plates, both stars are usually distinctly visible separately.

From our observations, the star is an eclipsing variable, either of Algol type with non-spherical components or even of β Lyr type, with the period as short as $0\overset{\mathrm{d}}{.}48$, more characteristic of EW stars or cataclysmic systems. Moscow plates show variations between $14\overset{\mathrm{m}}{.}0$ and $15\overset{\mathrm{m}}{.}0B$. The secondary minimum, though not deep, is clearly present. The mean light curve from Moscow plates is shown in Figure 1. Dates of minima derived from seasonal light curves are collected in Table 2. The star definitely shows period variations, apparently not abrupt but continuous (see Figure 2). The elements

$$\begin{array}{c} \mathrm{Min(hel)} = 2424382.388 + 0\overset{\mathrm{d}}{.}48182392 \times E - 4\overset{\mathrm{d}}{.}6 \times 10^{-11} \times E^2 \\ \pm 0.003 \quad \pm 0.00000032 \qquad \pm 0.6 \end{array} \tag{3}$$

represent the observations quite satisfactory; $(O-C)$ values from elements (3) are presented in the last column of Table 2.

CCD observations of V936 Aql are highly desirable.

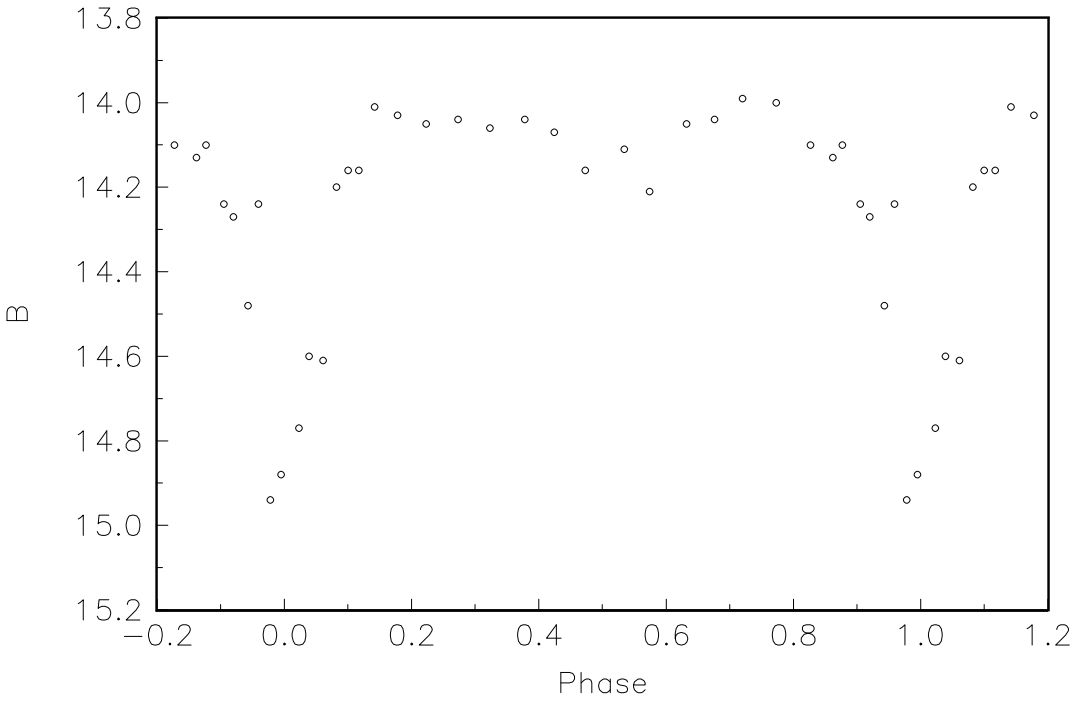

Figure 1. The mean light curve of V936 Aql from Moscow plates

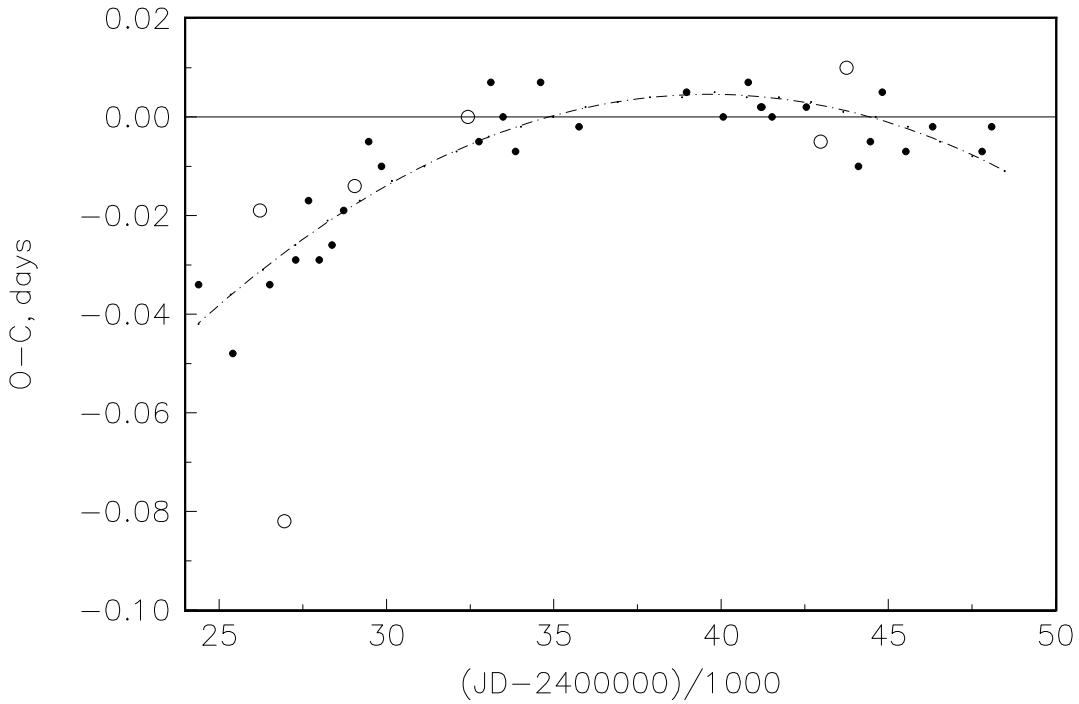

Figure 2. The $O-C$ plot for V936 Aql. The $O-C$ values are from the preliminary linear light elements Min = JD 2441521.285 + $0^{\rm d}.481821 \times E$. Open circles, uncertain values. The curve is the parabola corresponding to Eq. (3).

References:

Cannon, A.J. 1927, Harvard Obs. Circ. No. 265
Harwood, M. 1962, Leiden Obs. Ann. 21, 387
Kreiner, J.M. 1976, Acta Astron. 26, 341
Oosterhoff, P.Th. 1943, BAN 9, 399
Szafraniec, R. 1963, Acta Astron. Suppl. 6