MO PUP: LOST AND FOUND

Marvin E. Baldwin
8655 No. County Rd. 775E
Butlerville, IN 47223

Christopher Stephan
219 Andretti Avenue
Sebring, FL 33870

David B. Williams
P.O. Box 58
Whitestown, IN 46075

Presented at the 85th Annual Meeting of the AAVSO, November 2, 1996; received January 12, 1999

Abstract

After unsuccessful efforts to find the eclipsing binary MO Puppis in the sky, a search of the discovery plates at Sonneberg Observatory revealed that its published position was in error by one degree in declination. Once located, observations on Harvard College Observatory plates produced a probable period, which was then confirmed and improved by visual observations.

1. Introduction

MO Puppis (S 4077 Pup, GSC 5404-0593) is listed in the *General Catalogue of Variable Stars* (Kholopov *et al.* 1985) as a suspected eclipsing binary with a range of 11.7–12.5 ptg and a period possibly related to 1.06/n days, based on its discovery by Hoffmeister and subsequent investigation at Sonneberg Observatory (Ahnert and Huth 1954, Gessner 1966). The reported position is R.A. = $07^h\ 28.5^m$ Decl. = $-12°54'$ (1950).

At the 1993 Spring Meeting of the AAVSO, Baldwin included a note on MO Pup in the report of the Eclipsing Binary Committee. Because of the unknown period, he and Stephan had attempted to observe the star as part of a project to determine periods for several neglected variables in Puppis. However, they were unable to identify the variable when they compared the published finding chart (Anonymous 1957) with the star field at MO Pup's published position.

2. Finding the variable

After hearing this report, Martha Hazen of Harvard College Observatory put Baldwin in contact with Peter Kroll at Sonneberg Observatory. Kroll was also unable to identify MO Pup at the published position from an inspection of Sonneberg plates. Jan Manek of Stefanik Observatory in Prague was visiting Sonneberg at the time and volunteered to investigate the problem. He located the plate bearing the discovery marks for new variables and matched the star marked as number 60 in Hoffmeister's logbook with the published finding chart. A check of the star's position revealed that its declination is $-11°54'$, exactly one degree north of the published position.

According to Wolfgang Wenzel, then director of Sonneberg Observatory, this

Table 1. Times of minima of MO Pup.

HJD 2400000+	*Obs.*	*E*	*O–C [Eq. (1)]*	*HJD 2400000+*	*Obs.*	*E*	*O–C [Eq. (1)]*
25565.536	H	–5789	–0.068	46827.039	H	+5792	–0.017
25982.473	H	–5562	+0.122	47565.021	H	+6194	–0.063
26312.860	H	–5382	+0.048	49404.731	St	+7196	+0.085
27043.542	H	–4984	+0.046	49415.609	St	+7202	–0.053
27515.322	H	–4727	+0.002	49415.674	B	+7202	+0.012
28253.328	H	–4325	–0.020	49714.927	B	+7365	+0.015
28925.295	H	–3959	+0.011	49740.598	St	+7379	–0.016
29635.691	H	–3572	–0.083	49749.801	B	+7384	+0.007
30026.808	H	–3359	–0.011	49751.615	B	+7385	–0.015
30700.555	H	–2992	–0.036	49773.659	B	+7397	–0.001
30724.460	H	–2979	+0.003	49773.701	St	+7397	+0.041
31185.241	H	–2728	–0.025	50109.594	St	+7580	–0.034
32198.673	H	–2176	–0.005	50153.681	B	+7604	–0.009
36193.563	S	0	–0.013	50155.587	St	+7605	+0.061

H = Harvard, S = Sonneberg, B = Baldwin, St = Stephan

kind of error was not uncommon for newly-discovered southern variables. Each new variable was plotted by hand on the BD chart, and its position was derived from the chart's coordinate grid. Investigators were accustomed to determining positions on the northern hemisphere charts. On southern charts, with the direction of increasing declination reversed, a mistake in reading the coordinate grid resulted in a position error of exactly one degree.

Using the correct position and a new finding chart provided by Kroll from a scanned plate (Figure 1), Baldwin and Stephan were able to begin visual monitoring of MO Pup.

3. Determining the period

Baldwin and Stephan made 235 and 128 visual estimates, respectively, during the 1994 and 1995 seasons. In support of this project, Williams also observed MO Pup on 284 Harvard patrol plates from 1928 to 1989. He found 15 plates on which MO Pup was recorded at or near minimum light, and analysis of the times of these plates indicated a likely period of about 1.836 days. The times of Baldwin's and Stephan's faintest visual estimates were then combined with the plate minima from Sonneberg and Harvard (Table 1), and a least-squares solution of all 28 times yielded the following light elements:

$$\begin{aligned} \text{Min. I} = \text{HJD } 2436193.576 &+ 1.8358908\ E \\ \pm 0.009 &\pm 0.0000016 \end{aligned} \qquad (1)$$

Reduction of the photographic and visual observations to the phases of these elements produced a reasonably convincing light curve (Figure 2). The eclipse duration is about 0.1 P. There is no indication of a secondary minimum at phase 0.5, so the possibility remains open that MO Pup could have two minima of nearly equal depth and a period twice the value of the period in equation (1). A high-precision photoelectric light curve or radial velocity observations are needed to resolve this question.

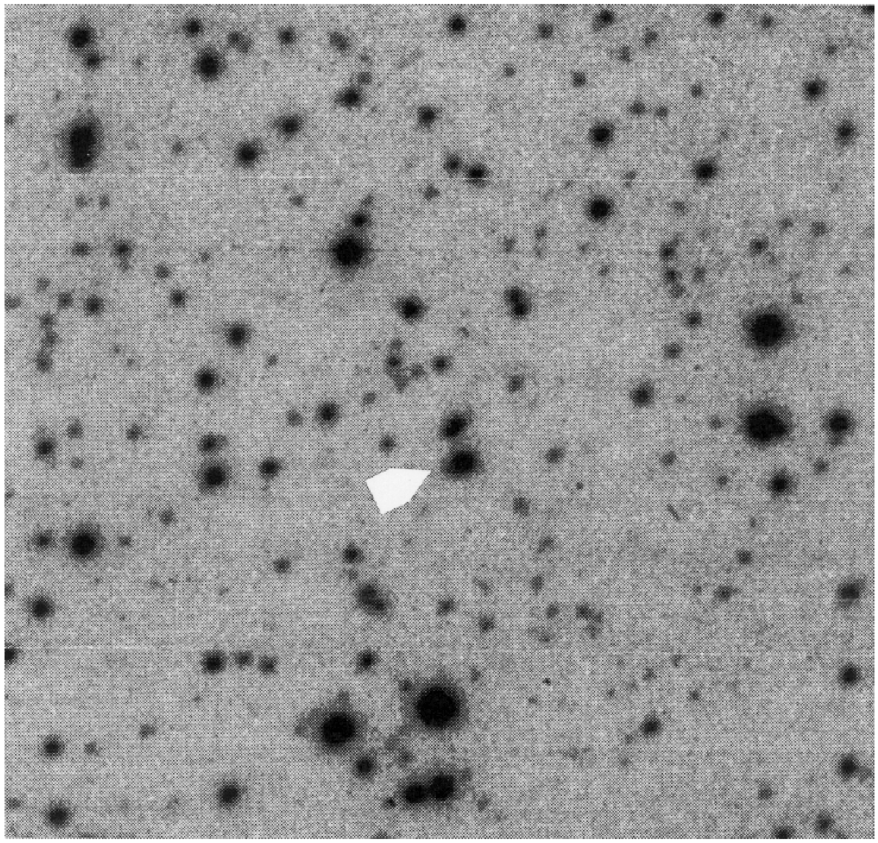

Figure 1. Finding chart for MO Pup from a scanned Sonneberg Observatory plate, 13 arcminutes square. North above, East left.

4. Acknowledgements

This project was successfully concluded through the collaborative efforts of amateur and professional astronomers on two continents. We would like to thank Martha Hazen of Harvard and Peter Kroll of Sonneberg for their interest and assistance, and Jan Manek for solving the mystery of MO Pup's position.

References

Anonymous 1957, *Mitt. Veränd. Sterne*, No. 296.

Ahnert, P., and Huth, H. 1954, *Veröff. Sternwarte Sonn.*, **2**, 2.

Gessner, H. 1966, *Veröff. Sternwarte Sonn.*, **7**, 65.

Kholopov, P. N. *et al.* 1985, *General Catalogue of Variable Stars*, 4th ed., Moscow.

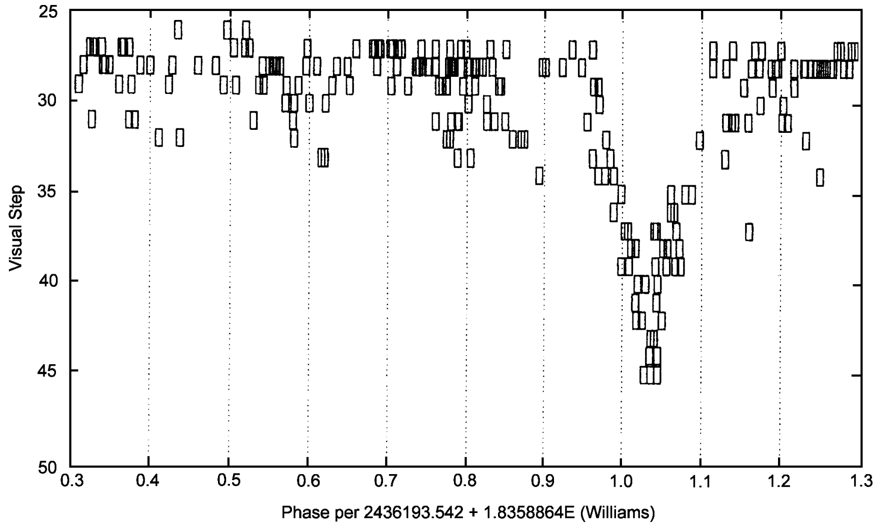

Figure 2. Light curve of MO Pup compiled from Baldwin's visual estimates (JD 2449389–2450169). The observations were phased according to preliminary light elements, so the minimum does not fall exactly at phase 0.00.