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**SAO 189111 IN SAGITTARIUS IS AN ECLIPSING BINARY**

The variability of SAO 189111 = DM -28°16553 = HD 192825 was noticed when it was used as a check star in a programme of asteroid photometry. We have been unable to find any reference to the variability of this star in either the GCVS (Kholopov 1987), NSV (Kholopov 1982) or in the SIMBAD database, and presume it has not previously been reported. The star appears to be an eclipsing binary.

The initial observations were made with the 0.61-m *f*/16 reflector of the Mt John University Observatory using a cooled EMI9558 photomultiplier tube and Johnson-Cousins UBVR filters. Follow-up observations were obtained at Mt John and at the Black Birch Observatory, near Blenheim, New Zealand, the latter using a 0.41-m *f*/13.5 reflector and cooled EMI 9558B tube. Comparison and check star details are in Table 1. The journal of observations is given in Table 2. A finder chart appears in Figure 1.

TABLE 1: Catalogue Data

	R.A. (1950)	DEC.	Observed Magnitude	Spec.	
SAO 189111	20 <sup>h</sup> 14 <sup>m</sup> 55 <sup>s</sup> .3	-28° 17' 21"	8.9 - 9.2	G?	Variable
SAO 189070	20 <sup>h</sup> 12 <sup>m</sup> 20 <sup>s</sup> .5	-29° 21' 29"	10.2	G5	Comparison
SAO 189004	20 <sup>h</sup> 08 <sup>m</sup> 50 <sup>s</sup> .8	-29° 04' 43"	9.5	G5	Check

TABLE 2: Journal of Observations

U.T. Date	HJD 2448800+	Number of Measures	Filters	Observers	Place
July 24	28.0412 - 28.2970	14	BV	B,K	MJUO
July 30	33.9118 - 34.1731	16	BV	B	MJUO
July 31	34.9870 - 35.1067	9	BV	B	MJUO
August 5	39.9574 - 40.2280	14	BVRI	G	MJUO
August 17	51.8872 - 52.0826	8	UBVR	G	MJUO
August 19	54.1616 - 54.2104	4	UBV	G	MJUO
August 21	56.0057 - 56.1282	14	UBVR	B	BBO
August 22	56.8383 - 57.2058	39	UBVR	B	BBO
August 23	57.8149 - 58.2061	41	UBVR	B	BBO
September 17	82.9079 - 83.1283	10	UBVR	G	MJUO

Notes: Observers : B = Blow, G = Gilmore, K = Kissling.

Place : BBO = Black Birch Observatory, 0.41 m *f*/13.5 reflector.

MJUO = Mt John University Observatory, 0.6 m *f*/16 & *f*/13 reflectors.

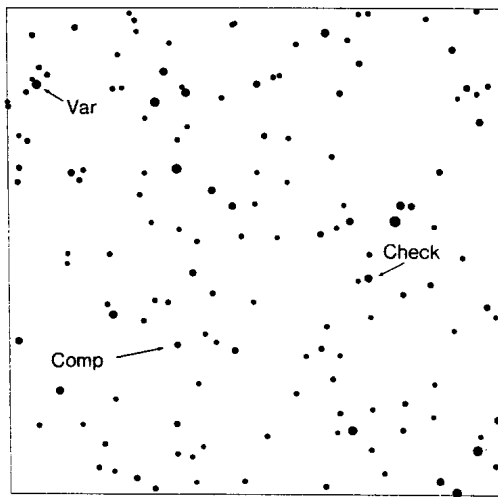
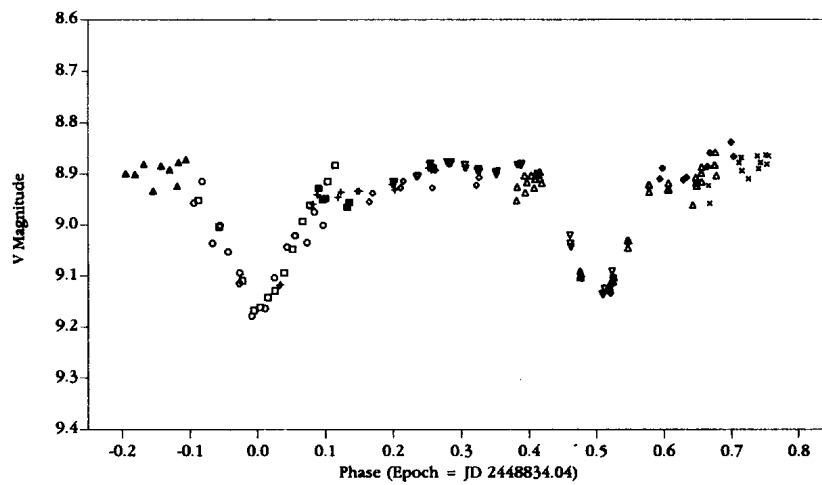


FIGURE 1: Field of SAO 189111

SAO 189111



□ Jul 24 (MJ)	◆ Aug 17 (MJ)	▽ Aug 23 (BB)
○ Jul 30 (MJ)	■ Aug 19 (MJ)	● Sep 17 (MJ)
▲ Jul 31 (MJ)	× Aug 21 (BB)	
+ Aug 5 (MJ)	△ Aug 22 (BB)	

FIGURE 2: Plot of V Magnitude versus Phase

From measures of A. W. J. Cousins's E region standards (Menzies et al, 1980) the comparison star was found to have  $V = 10.17$ ,  $U-B = +0.06$ ,  $B-V = +0.56$ ,  $V-R = +0.35$ ,  $V-I = +0.68$ . These values were added to the standard differential magnitudes of the variable.

On nights where variability was noted, both the V and B light curves followed portions of a smooth decline and rebrightening covering about 0.3 magnitudes over a period of approximately six hours. Definite minima occurred on July 24 and 30, and on August 22 and 23. Although all the minima are very similar in shape, those observed in July are slightly wider and deeper than those observed in August.

The observed minima in the lightcurve are best matched with a period of 1.177 days. Since minima were observed on the nights of both August 22 and 23, periods longer than 1.177 days are not possible. Times of primary minimum are given by:

$$\text{HJD (Primary Min.)} = 2448834.04 + 1.177 E$$

$$\quad \quad \quad \pm 0.01 \quad 0.001$$

A plot of the V data based on a period of 1.177 days appears in Figure 2. The combined colour data was noisy, probably due to frequently poor skies. No convincing evidence for variation in colour from a mean  $B-V = 0.65$  was seen.

The shape of the lightcurve and the period suggest a close eclipsing binary system. We note that the Michigan Spectral Catalogue (Houk 1982) describes SAO 189111 as being of composite spectral types "G5/8 + A/F", consistent with this deduction. The possible plateau feature following primary eclipse may suggest the presence of a chromospherically active star.

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#### References:

- Houk, Nancy (1982) Michigan Catalogue of Two-Dimensional Spectral Types for the HD stars, Vol 3., University of Michigan.
- Kholopov, P.N. (ed) (1982) New Catalogue of Suspected Variable Stars, Nauka, Moscow.
- Kholopov, P.N. (ed) (1987) General Catalogue of Variable Stars, 4th Edition, Nauka, Moscow.
- Menzies, J.W., Banfield, R.M. & Laing, J.D., (1980). Standard Stars for Photoelectric Photometry on the UB<sub>V</sub> and (R<sub>I</sub>)K<sub>C</sub> Systems, SAAO, Cape Town.