

REVISED AND UPDATED PERIODS FOR TWELVE
VARIABLES IN SAGITTARIUS

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Twelve stars in VSF 193 in Sagittarius were studied. These objects were all long period variables which have previously been studied, but which for various reasons needed revising or updating.

Nine of the variables have two or more published periods. By analysis of all previously published available data, combined with estimates from our own plate collection, I have been able to update these nine stars. In most cases I have been able to make a definite choice between the alternate periods and to improve upon the one chosen.

The plates available at the Maria Mitchell Observatory included Nantucket (NA) plates and Harvard (A, B and MF) plates. Every star except one was measured on the NA plates, which date from 1957 to 1972. For those stars located on the MF and B plates, which have a southern limit of -28° , these plates were also estimated for those stars which had not been already measured on them. The Harvard plates date from 1924 to 1953.

Two stars deserve special comment. V938 Sgr was too faint to be measured on the NA plates. Innes (1917) gives a period of 220.7 days for this star, and Plaut (1971) gives 219.5 and 137 as alternate periods. Combining data from Innes and Plaut tends to indicate that 138 days is a more satisfactory period than 220, but there are still some ambiguities. More observations of this star are desirable to make a more decisive choice. Figure 1 shows composite light curves for V938 for the two periods.

The Star MW Sgr has several previously published epochs of maximum and periods which are discordant, despite the fact that two of the periods are nearly the same. Innes (1917) gives $18916+260n$; Ponsen (1957), $30167+207n$; Hoffleit (1959) $24400+208.5n$ and the General Catalog of Variable Stars (1969), $30167+208.3$. None of these periods will fit all of the published epochs of maximum. Further study of this star indicates that its period changes sinusoidally according to the function

$$\text{Max} = 36085 + 204n + 15 \sin 4.95(n+42).$$

Figure 2 shows the O-C curve for MW Sgr based on the revised period of 204 days. Further observations of this star, confirming or denying the function of the changing period, are much to be desired.

I also studied two variables discovered by Hoffleit in VSF 193 for which the General Catalog of Variable Stars (1969) gives incorrect information. For one star, V1703 Sgr, the Catalog gives a period of 312 days instead of 207 days, which was the period previously determined. Evidently this star was confused with V2378 Sgr which is located nearby and which has a period of 312 days as confirmed by my estimates of NA plates dating from JD 2438886 to the present. I revised the period of V1703 Sgr to 206 days. The other star, V1709 Sgr, is classified incorrectly in the General Catalog as type UG. Hoffleit (1957) had originally classified it as

Mira-type with a period of 212 days. I determined a period of 210.8 days for this Mira-type star.

The accompanying table summarizes the data on the twelve stars. This work was done as an NSF undergraduate research participant at the Maria Mitchell Observatory under the direction of Dr. Dorrit Hoffleit.

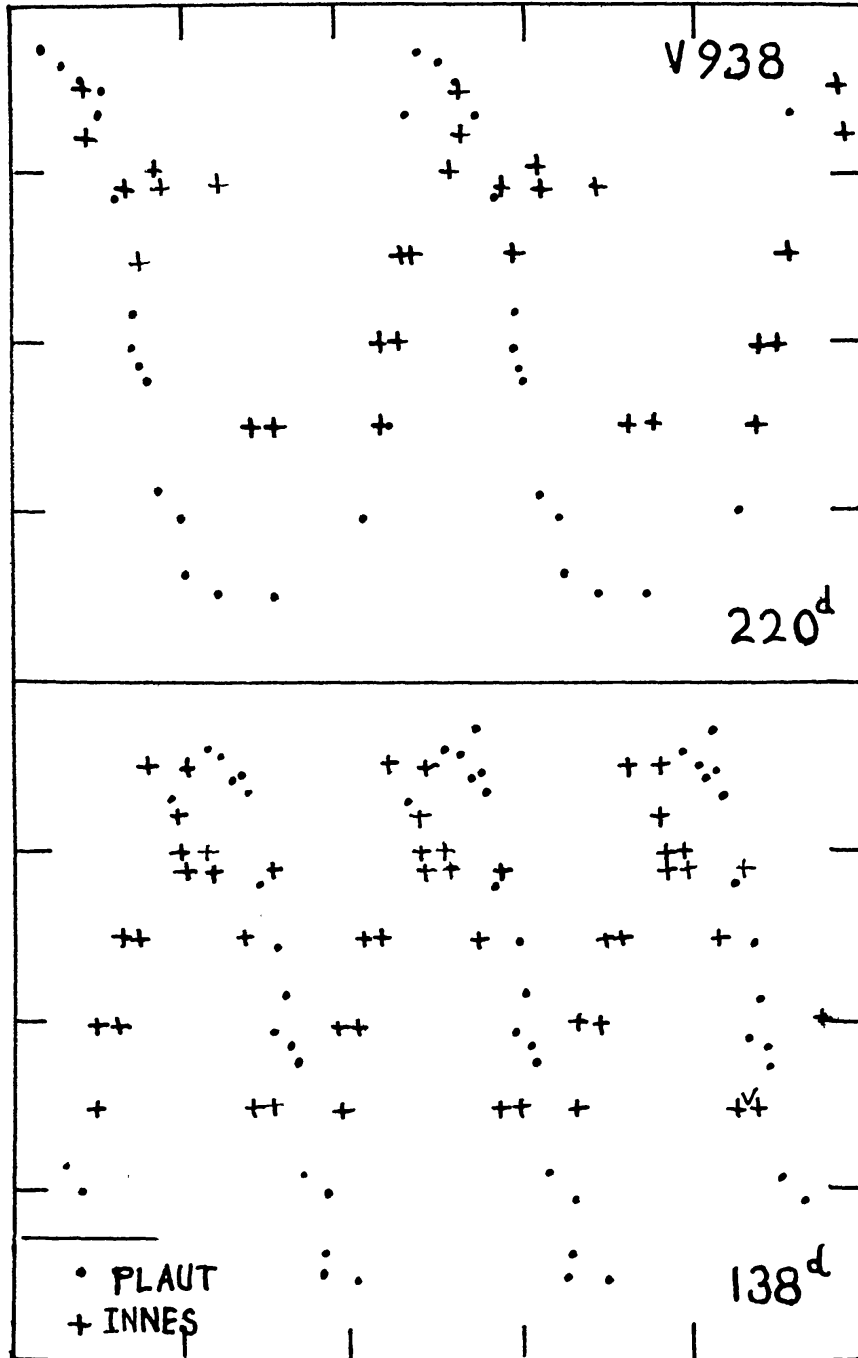


Figure 1. The observations of V938 Sgr represented by two alternative periods.

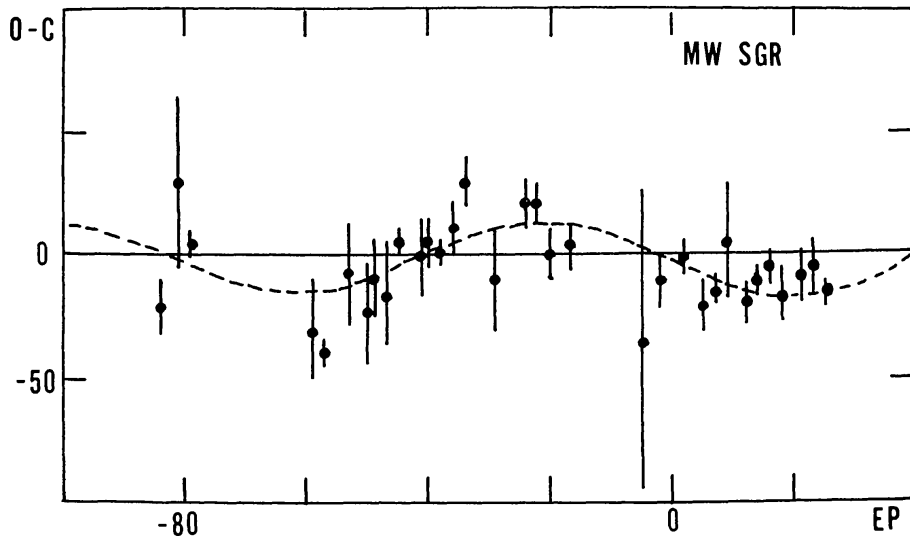


Fig. 2. The O-C for a period of 204 Days. The smooth curve represents the correction to the phase, $15 \sin 4.5^\circ$ ($n=42$). Vertical bars indicate the range of uncertainty of observed (or extrapolated) times of maximum. The three earliest points are for Innes' observations. The long bar at epoch - 5 represents the image on the Lick Atlas chart of this region.

TABLE I, SUMMARY OF DATA ON TWELVE STARS IN SAGITTARIUS

Star Sgr	Other Designations	Type	Magnitudes	Epoch*	Published Periods	Source Reference	Updated period	Re-marks
AO	CoD-29 ^o 14636	-	10.3-11.5	<u>33090</u>	143.3 262	8 1		a
MW	Innes 60 Ponsen 50	M	12.8-(15.6	36085	260 207 208.5 <u>208.3</u>	6 10 4	204 changing	b
V929	Innes 2 Plaut 826	M	12.5- 17	35687	196.8 <u>400</u>	9 9	194.5	
V932	Ponsen 67 Plaut 1041	M	12.7-(15.7	28422	255 227.5 142	10 9 9	225	c
V938	Innes 23 Plaut 1196	SR	15 -17:	<u>19575</u>	220.7 219.5 137	6 9 9	138 preferred	d
V1293	Fokker 19 Plaut 700	M	13.1-15.8	27711	153 154.8 272	2 9 9	155	
V1703	HV12398	M	13.7-15.8	<u>26120</u>	207	3	206	e
V1709	HV12404	M	13.1-(16.1	26160	212	3	210.8	f
V1835	Ponsen 22 Plaut 277	M	13.9-(16.2	27635	262 173 262:	10 9 9	262	g
V1836	Ponsen 23 Plaut 294	SR	14.0-15.8	27635	244 242 301.5	10 9 9	244	
V1919	Ponsen 83 Plaut 1341	SR	13.9-15.6	27635	162 162.8 189.4	10 9 9	163	
V2378	Hoffleit 22	M	13.7-(15.5	<u>36750</u>	<u>312</u>	5	312	

*Underlined epochs and periods are as listed in the General Catalog of Variable Stars (1969). This is also the source of all the magnitudes listed.

REMARKS TO TABLE

- a. AO Sgr is overexposed on the NA plates, and its variability is not confirmed. A period of 262 days will not fit Payne-Gaposchkin's data, and her 143.3 days will not fit the two maxima on which Kukarkin's period is based.
- b. There is a discordance between the various published elements. In trying to resolve this, I found that the period is changing, as described in the text.
- c. Ponsen's maxima are peculiar in that they vary in amplitude by 2.5 mag., on the assumption of a linear scale for his steps.
- d. A period of around 220 days will not fit Innes' data as well as 138 days. Hence a period of 138 days is preferred, but 220 days is not entirely ruled out. The NA plates are too poor to be measured for this star.
- e. Kukarkin gives a period of 312 days. Evidently he confused this star with nearby V2378 Sgr because AAVSO Abstracts, Fall, 1964, gave only approximate positions.
- f. Kukarkin lists this star as type UG, which has been disproved, as noted previously by Hoffleit (1957). The UG type corresponds to V2383, for which only a crude position had been given in the AAVSO Abstracts.
- g. One Leiden observation, invisible at JD 2427901.6, is discordant.

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